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IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

VLSI TECHNOLOGY LLC *
*
VS. * CIVIL ACTION NO. W-21-CV-57
*
INTEL CORPORATION * February 25, 2021

BEFORE THE HONORABLE ALAN D ALBRIGHT, JUDGE PRESIDING
JURY TRIAL PROCEEDINGS
VOLUME 4 OF 7

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08:02 (February 25, 2021, 8:34 a.m.)

08:34 THE BAILIFF: All rise.

08:34 THE COURT: Good morning, everyone. Thank you. You may be seated.

08:34 Mr. Chu?

08:34 MR. CHU: A number of housekeeping items.

08:34 THE COURT: Okay.

08:34 MR. CHU: One, there's a time issue. We agree with Ms. Miles' time. There's a minute or two discrepancy which we would expect. I understand that Intel disagrees and that their time is correct, and they want to add time to the VLSI side.

08:35 Second, a report on deposition plays. A variety of things have been occurring. I think we're going to work everything out. An example would be Intel pulled a certain witness who we thought was going to be live, so we did some counter-designations. I know early this morning there was some e-mail traffic between counsel at 2:00 a.m. and 4:00 a.m.

08:35 Our hope is that we will get the bulk, if not everything, to Your Honor midday with whatever the objections are. And then after Your Honor rules, we'll have our technical person tee everything up so either side can play deposition portions.

08:36 THE COURT: Okay.

08:36 MR. CHU: Third, there's a Fortress issue, and Evan Pearson had requested some materials. We'll get that to your chambers by noon today, is what I'm told by members of my team.

THE COURT: Let me -- if it wasn't clear, what I want is anything that -- and this is actually for Mr. Lee -- anything that Mr. Lee -- and this would not be limited to just -- anything that Intel wants to put in where Fortress is mentioned, I want to have that by noon so I can read and see what it is that Intel wants to put in that relates to Fortress.

MR. CHU: Excellent.

There's an issue regarding Jonathan Douglas, who I think is the second witness to be called. In a moment I'll ask my colleague, Mr. Hattenbach, to address it.

There is another Intel witness, a Dr. Rotem, but I think he's coming on in the afternoon. And I guess we may or may not get to him today, so I don't think it's necessary for us to argue about that this morning. But if the Court would like, my colleague, Mr. Redjaian, will argue.

THE COURT: Let's hold off on that until after lunch.

MR. CHU: Okay. I think those are the issues. And I'm going to turn it over to Mr. Hattenbach.

THE COURT: Mr. Lee?

MR. LEE: Your Honor, on the time, we'll work it out. I think the way we're progressing, the discrepancy is not going to make a difference one way or another. So this is just not something that we've had a chance to work out.

On the additional designations, you will have an objection from us. This was someone who was on our may-call list. And

they designated people who are on our may-call list with the three days' advance notice required by the pretrial order. They haven't done this as to this.

And we'll object on that basis because -- particularly in a trial moving this quickly, that three days' notice is pretty darn important.

The second thing is I'm a little confused. I thought that they were going to play the deposition designations and then rest, in part, because Your Honor knows I then have to offer you in summary form the JMOL, and I need to know the target that I'm shooting at.

And so I think it needs be either one of two things. Either we have them play theirs and they rest, or we're very clear on what they're going to play later. It's not a moving target, and then I can make motions appropriately.

THE COURT: Okay. I'm not -- what I'm not quite -- I get the big picture of what you're saying. I get all that. I'm not sure what it is you're asking me to do right now, because I understand that when they rest, they rest, you move, you move. And you're afraid -- legitimately concerned, not afraid, concerned that they might be putting in things in your case that you may want to force them to put in the case before you rest.

MR. LEE: That's exactly it, Your Honor. I don't want our case -- you know, we have not interrupted their case to

interject --

THE COURT: But I don't know what you want me to do.

MR. LEE: No. I think, Your Honor, I just have a question, which is Ms. Proctor said yesterday that they would finish their case today by playing a half hour of depositions. That's what we thought was correct. And I guess the first question is: Is that what we're going to do?

THE COURT: Okay. Mr. Chu?

MR. CHU: I think all of this is a non-issue. Let me give you an example. We fully disclosed in the slides for Dr. Conte, I think on Monday, everything that he was going to use. Then the issue arose and Your Honor said we should play all those deposition clips, and we accept that.

But they've known about that, and I don't know the exact timing, but I was informed that we kept asking for counter-designations and we weren't getting them. And so maybe they have counter-designations. We might have counter-counters. But we're not trying to leave things open. We're just trying to get everything settled and done. And I think, I'm told, we hope that we can have everything done by noon. It's not a moving target.

I'm also told --

THE COURT: Well, but you're going to be done with your case before then, right?

MR. CHU: We will have no more witnesses to call.

08:40 THE COURT: You have no more witnesses to call, live witnesses to call right now, right?

08:40 MR. CHU: Right. Yes, in terms of the case-in-chief. That's correct.

08:40 THE COURT: And so when we start, what you're going to do is play deposition transcripts?

08:40 MR. CHU: No. Because I am told there's still issues to be settled between the parties. And I'm told that we are working them out. And the lawyers on our side believe it'll be worked out. And then there are the objections.

08:41 THE COURT: So, Mr. Lee, assuming -- other than let's say that Mr. Chu wants to play a portion -- other than what you might object to just because you would object to it regardless of whether it was in VLSI's case or whether it's presented as a counter-designation in yours, does Intel have everything from VLSI that VLSI intends to offer?

08:41 MR. LEE: I have no idea, Your Honor. And the best indication --

08:41 I'll stay here -- if Kristie can hear me -- and bend over.

08:41 The best indication, Your Honor, I think you asked yesterday when they said there'd be a half hour of depositions to play, for them to send you the objections. We don't know if that's been given to you or not. We didn't receive any copies.

08:41 So I really have a simple question which is: Since they have no more witnesses, what happens next? And my real concern

is, you know, we have an order of the presentation of our case just as they did. And stopping after two witnesses and interjecting a half hour to an hour of their deposition designations --

THE COURT: Well, we're not going to do that.

MR. LEE: Okay.

THE COURT: And so I'm at loss, Mr. Chu, what you're asking me to do.

MR. CHU: First of all, this is not a moving target. I am told that we have provided Intel's counsel with all the designations and counter-designations, period.

THE COURT: Let me try it like this. When I say, Mr. Chu, you may call your first witness this morning, do you have prepared to go every deposition where you were putting on what you want to put on affirmatively in your case that is in a deposition?

MR. CHU: The answer is no, because I'm told that there are a few issues to work out.

THE COURT: And are those issues objections? Or what?

MR. CHU: No. I know there are objections, but I think that there are -- I'll say it neutrally. There are some disputes about the propriety of one side's designations or counter-designations.

So let me state it this way, because obviously the jury and the Court's time is very valuable. We're prepared to rest

subject to the deposition plays. Our hope and belief is we will have all those to Your Honor by midday, and then we'll be prepared to play all of those.

Now --

THE COURT: You want to put your -- you want to put something in your case on after Intel started? That's what I think I'm hearing.

MR. CHU: Well, I'm just assuming that we wouldn't have -- if we had the deposition designations done and had them all loaded, we would play them, period. It hasn't happened, and therefore we would ask for the grace of the Court so that we will not have formally rested until we finish playing the deposition designations.

We'd be happy to play them at the earliest possible time today or some other time. There's a great part of this, Your Honor, just to let you know what's at issue, that related to Professor Conte. So Your Honor said what we should do is to play the designations and the counter-designations. What we want before the jury has been put before the jury and subject to cross-examination.

There are a few other subjects, but that's it. We've tried to be very skinny with our designations and counter-designations.

THE COURT: Mr. Lee?

MR. LEE: Two things, Your Honor. The first is, as we

08:45 understood the procedure last evening, Your Honor asked to have
08:45 submitted to you the excerpts of what was objected to and that
08:45 Your Honor said you would do your best to get through them so
08:45 that they could show them today. And as I said, it doesn't
08:45 sound to me like Your Honor got anything. We certainly didn't.
08:45 Number two, as to the portions of Dr. Conte, the issue
08:45 Your Honor resolved the other day where he had quotes on the
08:45 slides, after seeing how it came in, we said to them, you don't
08:45 have to play the depositions. It's fine. You can have the
08:45 quotes you had on the slide. We don't think we need to waste
08:45 the time.
08:46 THE COURT: So, Mr. Chu, what is it that you need to put
08:46 in that would not be a counter-designation to what Mr. Lee is
08:46 going to play?
08:46 MR. CHU: Professor Conte's designations, and I assume
08:46 their --
08:46 THE COURT: I don't understand. When you say
08:46 Dr. Conte's -- things that he said in his depo?
08:46 MR. CHU: Oh, no. I'm sorry. I should have been clearer.
08:46 Professor Conte relied on testimony of certain witnesses.
08:46 THE COURT: Okay.
08:46 MR. CHU: Many Intel witnesses. He discussed those fully
08:46 during his direct examination. The testimony was on the
08:46 slides. The Court preferred that we, at some point, play those
08:46 depositions.

THE COURT: Okay. And have you provided to Intel right now what -- number one, is everything that you want to put in from an Intel witness going to be from an Intel witness that you have been told Intel is going to call by deposition?

MR. CHU: I don't know the answer to that, Your Honor. I just don't know. Some of them Intel -- at least one, maybe more than one I think Intel is going to call live. And I just don't --

THE COURT: So you can ask that person at that time.

MR. CHU: I just --

THE COURT: That person you can just get the testimony from live, because he'll either give you the testimony you want or you can impeach him if he says something different, but you're going to get that information in.

MR. CHU: Yes. But I just want to be -- to share with the Court the information I happen to have in my individual brain. I don't know the universe. I don't know whether it's three or seven witnesses. In some cases Professor Conte relied on a little snippet of someone's deposition testimony. And I just don't know whether those people are being called live or not.

But of course we could do it with a witness that does appear live. They have known about all of these --

THE COURT: But, Mr. Chu, you need to have this stuff on either -- you either need to put this in in your case or an agreement from Intel that they understand it's going to be a

cross-designation of someone that they're already calling.

MR. CHU: Well, we would like to put it in in our case, no question about it.

Now, I was just checking with one of my colleagues and he'll stand up and give me the end of an umbrella hook if what I'm saying is inaccurate. I think we could play Professor Conte clips, and there may be some others now. I just don't know what the universe is.

THE COURT: Or something else you could do. I assume you have physical copies of the depositions, right?

MR. CHU: Yes. But I do think we could play the clips.

THE COURT: Well, what I'm saying is you need to play whatever clips you want to play. Unless Mr. Lee says, okay, I got it. I'm going to call Mike Jones from Intel by deposition anyway. And it would save the Court some time for that to be -- I think Mr. Lee would agree if they're going to call that person anyway.

But, Mr. Lee, if you would prefer me to require them to -- here's the catch for you, Mr. Lee. If I require Mr. Chu to call one of those witness -- an Intel witness that you're going to put on by deposition anyway, then you're going to need to have your Intel stuff read in at the same time.

And so it makes sense to me, although I can't require you to do it, that if you are going to call -- if you are going to call a witness, and they have a designation --

counter-designation to it, that we do it in your case if you're going to call them anyway.

MR. LEE: Your Honor, I think we're talking about Mr. Borkowski, who we will call. And they know we're going to call him.

Here's the issue on what they call the Conte designations. We've told them that we have no objection to them playing the clip that was on the screen.

THE COURT: Right.

MR. LEE: What they've done is they've designated a whole bunch of other stuff that was never designated before another pretrial order, never the three days' notice.

So what we've said is designate or play just what was on the screen that Dr. Conte relied upon. This isn't a way to get around the deposition designation process.

THE COURT: I got you.

MR. LEE: And after Dr. Conte finished and the cross finished, we actually said to them, you know, you don't have to play it if you don't want to. We're not going to insist on it.

MR. CHU: Your Honor, I have a proposed solution. First of all, we're happy to do things any way Your Honor and Intel wants so that we can efficiently use the jury's time.

I'm told that we think we can play all the designations that we would like to play. I'm sure Mr. Lee will correct me if I misheard that they are okay with our not playing the clips

that Professor Conte referred to.

THE COURT: That's what I heard.

MR. CHU: And if that's the case, we can have people working on that, shortening it right now.

And then otherwise, I'm told, because we had already determined all of our designations and shared it with the other side, that we can play them now.

THE COURT: Okay. Mr. Lee, does that work for you?

MR. LEE: Yeah. If they could -- we don't have to do this with Your Honor. If they could just tell us who they're going to play, it would be helpful.

THE COURT: Okay.

MR. CHU: And just to be clear, at least what I was advised, because we've known our designations that we shared with them, we're playing just our designations. And then if they have counters, they can play them later.

MR. LEE: No, no. Your Honor, the pretrial order says that --

THE COURT: Hold on.

MR. LEE: Oh, sorry.

THE COURT: Mr. Lee, hold on.

Mr. Chu, you can finish and then...

MR. CHU: Here's a proposed solution. I'll speak to Mr. Lee now, talk to my colleagues, get a good idea --

THE COURT: And, Mr. Lee, that's what I'm trying to get

across to you, is if you are willing to allow -- if you want to have them read together, and I want that as well, if you'll agree that they can be done -- as odd as this sounds, that whatever you're going to put on that's the counter-designation to what they want to play, that can be done in your case, then can we do it that way?

I'm trying to figure out a way to keep the trial on track and to give them an opportunity to play theirs and have you play yours at the same time.

MR. LEE: Your Honor, and I don't mean to be difficult, but the pretrial order is pretty clear, and we relied upon it, that if you're going to play a deposition, there are notice requirements. But in addition to that, they're supposed to be played together and, particularly for some of the designations, having them played together is important.

And to give Your Honor an example, we have two sets of designations. Mr. Zhang, the inventor of one of the patents, and Cindy Simpson, we delivered to your chambers the transcripts with the objections I think three days ago as we're supposed to so that Your Honor would have a chance to read them before we put them on.

And when we play them, the designations that we're going to play, Your Honor, has both theirs and ours and we'll play them continuously.

That's what we're going to do in our case. We're going to

play their counter-designations.

THE COURT: So that -- it seems to me like we don't have a problem.

MR. CHU: I'm sorry. I --

THE COURT: I think what I heard Mr. Lee say is they are going to play theirs and your counter-designations during their case.

MR. LEE: No. The ones we've designated, not the ones he's talking about now. These are ones --

THE COURT: These are additional. These are additional ones.

MR. LEE: Yeah. I apologize, Your Honor. I -- maybe it's bending over.

The -- there are two sets. There are our designations, what we have designated under the pretrial order, and we have given to Your Honor the depositions highlighted with objections for the two that we know will come up in the next couple of days.

The only one that is different is Mr. Stolarski, which I raised with Your Honor yesterday, and we're trying to deal with today.

The separate issue is their designations, which we should have gotten three days ago. Some we did. We counter-designated to those, and they should, under the pretrial order, play them together. It would be not only

inconsistent with the pretrial order, but it would be unfair, given what -- some of what they designated, to play theirs and then wait for us to play ours in our case.

THE COURT: I agree.

MR. CHU: And I'm absolutely fine with that, Your Honor. It's just that --

THE COURT: So you can do that this morning?

MR. CHU: Let me check, but there was another issue that might shorten the play.

THE COURT: Okay.

MR. CHU: I said it maybe five minutes ago. I thought I heard Mr. Lee say that we did not need to play the depositions that were relied upon by Professor Conte. And if that's the case, then we can just shorten those -- we can cut out those designations and counter-designations. And they were all provided in a timely fashion. They were provided on Monday.

THE COURT: I know you both think I'm following you, and I'm doing my best.

MR. LEE: I think this one I can help with, Your Honor.

THE COURT: Okay.

MR. LEE: On this one Mr. Chu and I agree. For the excerpts that Dr. Conte put on his slides, which we had asked Your Honor to require go into evidence in some form, given what he said, given the fact he's talked about them, we don't see any need to insist that the depositions be played to see the

words again. So I think for those witnesses, designations --

THE COURT: We have --

MR. LEE: We don't need them. We can save some time.

MR. CHU: Otherwise, I'm told we can go forward this morning, and I'm sure one or two of my colleagues will work with our technical people --

THE COURT: And you can play both yours and Intel's cross-designations?

MR. CHU: That's my belief. And we have just saved a lot of time by not playing counter -- originals or counters relied upon by Professor Conte. And so --

THE COURT: Very good.

MR. CHU: -- we'll do that editing on the fly.

MR. LEE: And, Your Honor, the only thing I would ask for is, as they edit on the fly, if they would just give us what they think are the designations and counter-designations so we can double-check before the jury. We don't want to do it in front of the jury.

THE COURT: Understood.

Mr. Chu, do you have -- hopefully you came in here with at least 30 minutes of deposition testimony ready to go; is that right?

MR. CHU: May I?

THE COURT: Uh-huh.

(Conference between counsel.)

08:58 MR. CHU: Assuming we edited out what we just discussed, we think it'll be 30 minutes or less.

08:58 THE COURT: Okay. Why don't we do this. I'm going to go in the back, fix myself some tea or do something soothing.

08:58 When, Mr. Chu, you and your team and Mr. Lee and his team tell me that the deposition transcript is going to be played, is okay in terms of what was designated with both of you, I'll come back out and we'll bring the jury in.

08:58 MR. CHU: Just one other issue that I raised earlier.

08:59 THE COURT: I almost got out, Mr. Hattenbach. I never want to not take the chance to hear from him, if I have it. So if there's an issue he wants to take up, I'm happy to hear from him.

08:59 MR. CHU: I raised it at the beginning of this morning's session, that is their witness, Jonathan Douglas, and that's going to come up and --

08:59 THE COURT: Tell me what --

08:59 MR. CHU: -- with Your Honor's --

08:59 THE COURT: What is the issue?

08:59 MR. CHU: Okay. My colleague, Mr. Hattenbach, will do that, and I'm also asking my colleagues to communicate with Intel's counsel on the deposition, so we're going to multitask.

08:59 THE COURT: Very good. Yes, sir.

08:59 MR. HATTENBACH: Good morning, Your Honor.

08:59 So the issue with Mr. Douglas is that he is not an expert,

was never disclosed as an expert, no expert report, no expert deposition. And we get his demonstratives the other day and they looked very "expert-y" to me, if that's a word. And when we asked them what they were planning on doing with this demonstratives, they essentially wouldn't tell us. They said, well, he's going to, you know, talk about them and perhaps other things.

THE COURT: Tell me this: Is he an engineer?

MR. HATTENBACH: He is.

THE COURT: And he's going to get out -- he's going to come on here and tell me -- tell the jury how the products, their accused function?

MR. HATTENBACH: I assume that's going to be part of it, but I'm concerned that it'll go beyond that and --

THE COURT: Well, I'm concerned too. But I will tell you that the very hardest thing I have to do during these patent trials is to figure out with a person who is skilled in the art and this is what he does for a living, you know, if a person makes guitars for a living and you're suing him for a guitar patent and he comes in and says, here's how I make my guitars.

Here's what we're going to do. I understand this. I literally have to listen question by question on direct to try and figure out whether or not I think what that person is saying should -- is just something he knows or has wavered into.

I rely a great deal on, in this case, you to -- if you think something is an opinion rather than something that a skilled -- he's not -- that an engineer would say because he knows it. I'll rely on your objections. I know what you're taking up.

I would just suggest with regard to the slides that they not be shown to the jury, but if you would get me a set of them, I'll have them and I'll be going along. And if you have an objection to a slide, you can just stand up and say, Your Honor, we object. I'll be able to figure out whether or not I think it's admissible.

MR. HATTENBACH: Yeah. Appreciate it, Your Honor. I did some reading on this last night, and it seems like everyone feels it's a difficult issue and --

THE COURT: It is.

MR. HATTENBACH: -- the best I saw on it was someone's -- there's an article that concluded that if you're relying on things that you don't rely on in your normal work or if you've, you know, created them specially for litigation, then that's crossing the line. And so we definitely think some of their slides meet that description.

And, in fact, some of their slides are extremely similar to the ones that we got last night from their expert. And so that raised our concerns, but I will follow the approach Your Honor outlined. Thank you for your time.

09:02 THE COURT: I will tell you, and I haven't done this all that long, it's just been two and a half years, but -- and I understand after doing what y'all are doing for 20, the impact you think that these slides have on jurors or me, and I can tell you, I think you give them more weight than I think probably -- they're helpful, but I don't know that, you know, jurors pay that much attention. But I understand.

Do you have a list of the exact slides you are unhappy about?

MR. HATTENBACH: I can give that to you. So the two --

THE COURT: And if you'll hand me a copy of it.

MR. MUELLER: Your Honor, if I might, I could actually show you what I think is the center of the dispute. It's actually a little bit -- might I, Your Honor?

THE COURT: Absolutely.

MR. MUELLER: So, Your Honor, this is -- and we disclosed this. This is a board.

Your Honor, this is a board. It should come up in a second here. And let me just set the stage. So I'll zoom out here so you can see it, Your Honor.

The witness, Mr. Douglas, is a lead chip designer at Intel. This is -- these are components in the accused chips. All he's going to do is explain how they work from a factual perspective. It's not expert testimony.

And the reason why I wanted to show you this particular

board, Your Honor, is we don't think this needs to be sealed from the public. We're comfortable sharing it on the public feed. And so we wouldn't need to seal the courtroom or even turn off the monitors for this.

It's a sufficiently high level of generality, that we're not getting into details that would be too sensitive to share with the public. And so it's just the components in the chip, and he'll explain what does what. That's really it.

THE COURT: But I will tell you, Mr. Hattenbach [sic], I'm very reluctant to allow an engineer to get on and do that kind of teaching to the jury.

If there is something specifically about the accused Intel chips that he wants to talk about and explain, you have that right. I mean, they're your chips and you're -- they're being accused, and to the extent he has to do a little song and dance to get them into, you know, to do that.

But I am -- I am not going to give you all that much rope with an Intel witness to act as -- if I feel like he's being kind of a professor or an expert, I'm going to be reluctant to allow that.

MR. MUELLER: Understood, Your Honor. And I think we can lay a foundation for everything that we're going to do and tie it specifically to chip architecture in the accused chips that he has personal knowledge of.

THE COURT: That's going to be okay with me.

09:05 MR. MUELLER: Thank you, Your Honor.
09:05 THE COURT: Mr. Hattenbach -- and I will tell you, Mr. Hattenbach, that's a pretty generic exhibit.
09:05 MR. HATTENBACH: Yeah, our -- this probably looks a bit like what you just saw.
09:05 THE COURT: Why don't you tell -- just for your record, why don't you make sure.
09:05 MR. HATTENBACH: Sure. So let's start. This is the exhibit that we were given, and it's DDX-5.5 and that is the Jonathan Douglas presentation. This is the engineer, not the expert.
09:05 THE COURT: Oh, I understand.
09:05 MR. HATTENBACH: Here's the presentation we got last night from their expert, Dr. Sylvester, and it's that same diagram. And so the point is at Intel they don't go around working with boards like this where they can move little cartoons around. They work with schematics that they gave us during litigation. We think that --
09:06 THE COURT: Well, I understand, but this is a demonstrative. It's not going to go back to the jury, and I think it would help the jury understand what this gentleman is going to be explaining with regard to the Intel -- specific Intel circuitry, and that's what I'm going to limit him to.
09:06 MR. HATTENBACH: Thank you. We understand, Your Honor.
09:06 MR. MUELLER: Thank you, Your Honor.

09:06 THE COURT: Now, I'm not going to be interfering with what this gentleman says. That's up -- if you -- I assume, Mr. Hattenbach, that it's going to be your witness?

09:06 MR. HATTENBACH: That's correct.

09:06 THE COURT: But, I mean, if you want to object, if you think he's gone beyond what a percipient or fact witness should be able to testify about, you'll need to stand up and object. I'm not going to be doing the policing. But I am going to keep him on a short leash of what he's allowed to say that -- and he will not be able to give what I think are opinions.

09:07 MR. HATTENBACH: Right. And if it gets too professorial or expert-y, I may stand up and raise an objection.

09:07 THE COURT: Throughout this entire trial, either of you or any of you can stand up whenever you think it's appropriate to make an objection, and I'll rule on it.

09:07 MR. HATTENBACH: Thanks very much.

09:07 THE COURT: But I'll tell you, I get why this is so hard. This is the hardest thing for me to police as well. And I'm not going to proactively police it. But I'm very aware of -- and I want to be absolutely fair. I want to be fair to Intel. This is an Intel engineer.

09:07 He ought to get -- you're accusing him, Intel, of their chip infringing because of the way it operates, he ought to have some freedom to be able to explain that. But we don't allow opinions to come from people who are not designated, and

there's a reason we have reports.

So I'll do my best to try and be fair and keep -- allow him to say everything he should be able to and not allow him to say things that I think go beyond that.

MR. HATTENBACH: Thanks very much, Your Honor.

MR. MUELLER: Thank you, Your Honor.

THE COURT: Anything else we need to take up? Mr. Chu?

MR. CHU: Good news. We're ready to go, to play counters and the original designations by us and it'll be short.

THE COURT: Very good.

MR. LEE: Could we just know what's going to be played both ways?

THE COURT: I think Mr. Chu is telling me that --

MR. CHU: There's nothing new. I think they've been fully exchanged, and as far as I know, there are no objections.

MR. LEE: Your Honor, we'd just like a clip report or something. There's been a lot of back and forth, and I just want to know what's going to be played.

THE COURT: Sure. I'll tell you what. As much as I've enjoyed this discussion, I'm going to let you all work this part out. When you're ready to go, just let me know.

MR. CHU: Thank you, Your Honor.

THE BAILIFF: All rise.

(Recess taken from 9:09 to 9:32.)

THE BAILIFF: All rise.

09:32 THE COURT: You may be seated.

09:32 I'm told there are issues?

09:32 MR. CHU: We just wanted to inform the Court about a couple of things and then also there is an issue.

09:32 First, we have a list of exhibits to read in. We could do that later.

09:32 THE COURT: We'll do that later.

09:32 MR. CHU: Second, I spoke with Mr. Lee about this. We're in agreement that all of the material on Professor Conte's slides that relate to the witnesses, all that's in evidence and can be used as such.

09:33 Then the third thing is I am informed we have everything cut down to about ten minutes. That includes the counters, and it involves willfulness related issues.

09:33 There is an objection to our using some depositions of Intel witnesses from the Delaware case. The transcripts from the Delaware case have been exchanged. I'm also informed that Intel has designated materials from Delaware transcripts and the essence of the testimony is an engineer saying: My understanding, that the Intel policy, practice or custom is the engineer should not read patents, and that supports our willful blindness case.

09:33 THE COURT: Mr. Lee?

09:33 MR. LEE: Your Honor, two things.

09:33 As to Dr. Conte slides, that is the agreement for the

slides that were shown in court. He had another bunch of slides that he didn't use that had deposition testimony. I think we're only talking about the former, not the latter.

In the designations they've now given us, there were depositions that were cross-designated and there were some that weren't.

There are two engineers -- three who are designated from Delaware. Two of them have nothing to do with this case at all. They are engineers who worked on different products that are at issue in the Delaware case.

THE COURT: Those are not going to come in, unless they were not 30(b)(6)s, right?

MR. LEE: No. They were not 30(b)(6). They were fact witnesses in the Delaware case.

THE COURT: Then those will not come in.

MR. CHU: May I, Your Honor?

(Conference between counsel.)

MR. CHU: My understanding, Your Honor, is that they were talking about under oath a companywide policy.

THE COURT: I understand, but if they were not taken in this case, I'm not going to allow them in in this case. If they were just individual -- if they were individual engineers not speaking on behalf -- if this were a 30(b)(6), even in Delaware, I would consider allowing it in.

MR. CHU: Understood, Your Honor, and I think it'll be

efficient for us just to file an offer of proof with those portions of the transcript.

THE COURT: Okay.

MR. CHU: And I'm going to ask Mr. Simmons, can you take out -- Mr. Washburn, can you work with Mr. Simmons now to edit things and...

(Conference between counsel.)

MR. LEE: Your Honor, while they're doing this, I told Mr. Chu because post-suit willfulness is in the case, as our engineers begin to testify, we would in the normal course offer their views on the patents and what we're doing.

We understand that Your Honor has precluded that under the MILs, and so we won't be going into it. We'll make an offer of proof, but I didn't want to say nothing and just have it appear that we're waiving.

THE COURT: Understood.

MR. LEE: Okay.

THE COURT: Can that be done quickly enough that I can bring the jury in?

MR. CHU: Actually, Your Honor, if you bring the jury in right now, we will just rest our case.

THE COURT: Okay. That's what we shall do.

Now, that being said, Mr. Lee, since my guess is you heard -- learned of that when I did which is just now, do you need a minute or two to get your stuff set up so that we can --

09:36 MR. LEE: We're ready to go.

09:36 THE COURT: There we go. We're bringing the jury in.

09:36 THE BAILIFF: All rise.

09:39 (Recess taken from 9:36 to 9:39.)

09:39 THE BAILIFF: All rise.

09:39 THE COURT: Please remain standing for the jury.

09:39 (The jury entered the courtroom at 9:39.)

09:40 THE COURT: I'm sorry. Be seated.

09:40 You may call your next witness, Mr. Chu.

09:40 MR. CHU: Ladies and gentlemen of the jury, the plaintiff, VLSI, rests its case-in-chief. Good morning.

09:40 THE COURT: Thank you.

09:40 Mr. Lee, could I have you -- counsel up here for just a second?

09:40 MR. LEE: Sure.

09:40 (Bench conference.)

09:40 THE COURT: My preference would be to not have them leave and have you make your motion.

09:40 MR. LEE: Yeah. What I was going to stand up and say is we have motions to make. We'll make them at the break and save the jurors' time and then I'll call our first witness.

09:40 MR. CHU: Your Honor, I would agree that they have made the motion and it can be dated to this time after we rested, but --

09:41 MR. LEE: Whatever, Your Honor.

MR. CHU: -- whatever your preference is.

THE COURT: What we'll do is I'll enter on the record we have an agreement that we'll go through the morning as though whatever motion is made in a little while had been made.

Whenever we take a break, Mr. Lee, you can make whatever motions you want. I'm going to respectfully deny them, and then I want the record to show that we -- that you're accommodating the Court by not making me have the jury leave and go back.

MR. LEE: Okay. Thank you.

THE COURT: Mr. Chu, I appreciate it from you as well.

MR. LEE: Thank you, Your Honor.

MR. CHU: Thank you.

(Bench conference concludes.)

THE COURT: Mr. Lee?

MR. LEE: Thank you, Your Honor.

Ladies and gentlemen of the jury, I will begin Intel's direct case now, and Mr. Wren will present our first witness, Adam King, who I introduced during the opening.

And we're ready to proceed, Your Honor.

THE COURT: Thank you, sir.

(The witness was sworn.)

DIRECT EXAMINATION

BY MR. WREN:

Q. All right. Good morning, Mr. King.

09:42 A. Good morning.
09:42 Q. Would you start off by simply giving the jury your name and who you work for?
09:42 A. Sure. My name is Adam King. I work for Intel Corporation. I've been working for Intel for almost 28 years.
09:43 Q. And just to give the jury a little bit of background, can we just start with your family? Are you married? Do you have kids?
09:43 A. Yes. I've been married for almost 26 years. My wife grew up in New Mexico, went to school at Texas A&M. We have three children. Our oldest is a college student in St. Louis, and the other two are teenagers that are still at home.
09:43 Q. All right. What is your position at Intel?
09:43 A. I'm the vice president and general manager of strategic planning for the client computing group.
09:43 Q. In that position, what are your responsibilities?
09:43 A. My responsibilities include leading our strategic planning process, building our product road maps, and planning the actual products.
09:43 Q. How long have you been in this current position, this current job?
09:43 A. I've been in this role for about five years now.
09:43 Q. Let's back up, for starters, and ask about your education before Intel. What was your education?
09:44 A. I have a bachelor of science in engineering and

applied science from the California Institute of Technology, a master's degree in industrial engineering from the University of California and a master of management from MIT.

Q. Okay. And that last one was while you were with Intel, correct?

A. That's correct. They sent me to school there.

Q. Okay. So when did you start with Intel?

A. I started in 1993.

Q. And you've been there ever since, including that time period of getting that additional degree?

A. That's right.

Q. Let's back up to the positions you've held at Intel. What prior positions have you held at Intel?

A. Well, I started off in our manufacturing engineering group working on -- or developing equipment for our manufacturing facilities. And I did that for a number of years.

I went to business school, came back into our supply demand operations group that does demand forecasting and factory production plans and supply allocation to our customers.

I then went to Asia for a few years to run sales operations for all of our products and customers in the Asia Pacific region.

I came about ten years ago into the client commuting group

where I did product marketing for laptops for a few years.

Then I assumed my current position.

Q. Okay. You mentioned the document client computing group. What is the client computing group?

A. The client computing group is the group that designs and builds and sells microprocessors for PCs, for laptops and desktops and other devices as well.

Q. Okay. I think the jury has heard a little bit about client products and server products. What is the difference between those two segments?

A. Sure. By client, all we mean is a computer that a person uses, like a PC. A server is a computer that doesn't have a screen, that sits in a data center run by a company like Google or Amazon or Microsoft.

Q. Okay. And then in your current position you've mentioned product planning. What is product planning?

A. Product planning is all about trying to understand what the market needs, what customers want, what kind of improvements and features they're looking for and then planning a product that meets those needs.

Q. Okay. Let's talk about why you're here today. Have you ever testified before?

A. No. This is my first time.

Q. Have you been in a trial before, a court proceeding before?

09:46 A. No, I have not.
09:46 Q. So do you attend trials as part of your normal job responsibility?
09:46 A. No, I do not.
09:46 Q. Why is it then that you are here today?
09:46 A. Well, I'm here because in my career at Intel, and especially in my role in the last few years, I spend a lot of time with our engineers. And I'm always impressed by and grateful for their ability to solve problems and come up with new ideas and make great products. And essentially their work is under attack here, and I'm here to help defend them.
09:47 Q. So you are the corporate representative for Intel here in this trial?
09:47 A. Yes, I am.
09:47 Q. As the corporate representative, do you intend to see this trial through all the way, to be here every day?
09:47 A. Yes. I've been here from the start, and I'll be here till the end.
09:47 Q. Okay. You are aware that VLSI is accusing the '373 patent and the -- or excuse me -- accusing Intel products based on the '373 patent and the '759 patent?
09:47 A. Yes, I'm aware.
09:47 Q. Are you here to discuss the technical details of these patents?
09:48 A. No, I'm not. We have a few of our top engineers here

to go into the technical details.

Q. Okay. So what kind of information will you be providing to the jury?

A. I'm really here to introduce Intel Corporation to the ladies and gentlemen of the jury, to give you a little bit of Intel's history and background and in our business and what we're all about.

Q. All right. Let's turn to, briefly, the history of Intel. When was Intel founded?

A. It was founded in 1968.

Q. And who founded Intel?

A. It was founded by two very bright engineers named Robert Noyce and Gordon Moore.

Q. Okay. So going back to 1968, the founding, what was the state of computers at that point in time?

A. Computers were -- took up an entire room. They filled a large room full of racks of, you know, equipment and tape rails. They were giant.

Q. Okay.

MR. WREN: Let's pull up DDX-4.2. And I think this is a pair of pictures that the jury saw during opening statement.

BY MR. WREN:

Q. Could you explain what we're looking at on this slide?

A. Sure. So each of these two pictures shows one

computer. It was called a mainframe computer, but that's just one computer in each of those pictures.

Q. One computer in the entire room?

A. That's right.

Q. So what was the goal or the idea of the Intel founders?

A. Their idea was to miniaturize computers, to be able to shrink them from that giant room to something you could put on your desktop and make them smaller, faster, less expensive and lower-power in process.

Q. And what was their plan for doing that, for bringing about the shrinkage?

A. Well, they'd come up with an innovation. Robert Noyce was a co-inventor of the integrated circuit, which was taking all these big components that are in that mainframe and shrinking them onto a piece of silicon.

Q. Now, some 50 odd years later, what is Intel's business today?

A. We are still primarily selling microprocessors.

Q. And I know the jury has heard this, but just to remind us, what is a microprocessor?

A. It's the brains of the computer. It's the thing that processes all of the instructions that the software programs are throwing at it.

Q. Okay. Let's pull up DDX-4.3, this next slide.

09:50 What are we looking at here?

09:50 A. We're looking at an exploded view of a microprocessor. So the heart of it is really that pink-purple square in the middle. That's the piece of silicon that has all of the transistors and the wires that connect them. It's labeled "die."

09:51 And then that's put into that bigger green package. That package has a bunch of pins on it that allow you to attach it to a bigger circuit board. And then that metal cap on top that says "Intel" is just a protective shield.

09:51 Q. Okay. Let's go to the next slide.

09:51 And tell us what we're looking at here in this slide.

09:51 A. All right. You're looking at a fourth-generation core Haswell microprocessor next to a quarter so you can see the relative size.

09:51 Q. All right. We'll be coming back to these, but let me turn to this. Does Intel make computers to sell to its customers?

09:51 A. No, we don't. We sell them the microprocessor and other components as well, and they make the full computer.

09:51 Q. So how does -- how do these computer manufacturing customers utilize Intel microprocessors?

09:52 A. They design them into their computers.

09:52 So our direct customers are customers like Dell and Hewlett-Packard and Microsoft. And so they'll design the

overall laptop with the screen and keyboard and ports and other things, and then inside there is a circuit board that has our microprocessor and other components on it too, like memory and storage and, you know, WiFi chips and others.

Q. Can you provide the jury some examples of various types of end products that utilize Intel microprocessors?

A. Sure. Well, first of all, within the PC market, the PC market has a lot of different types of PCs, everything from big, high-end work stations that are used for computer modeling or scientific modeling, down to inexpensive Chromebooks that are used for education.

But beyond PCs our microprocessors can be found in a huge range of devices, everything from factory computers to medical equipment, like x-ray machines and MRI machines, to military equipment, like ruggedized laptops for the Army or servers for weapons systems or supercomputers for the Defense Department.

Q. I want to -- well, let me ask you first: Were you here when Dr. Conte was testifying?

A. Yes, I was.

Q. And I want to ask you about a statement he made.

MR. WREN: If we can bring up transcript onscreen from Page 569, Lines 10 through 19.

BY MR. WREN:

Q. And do you recall the question regarding whether there was any reason why NXP may not have decided -- or excuse

09:54 me -- yeah. May not have decided to use the '373 patent. Did you hear that question being asked?

A. Yes, I did.

Q. And did you hear Dr. Conte say NXP produces chips that go into planes and cars, and in situations like that, mission-critical situations, doing things like putting cores to sleep might risk someone's life, so you don't do that. It's okay to spend a little more power for safety. Did you hear that?

A. I did.

Q. And then when he was asked, is that different -- he was asked by VLSI's attorney -- is that different from Intel's business model, and he said yes.

A. I remember that.

Q. So I want to ask you about Dr. Conte's suggestion that NXP has not used these patents because it wouldn't want to put lives at risk. Does Intel put microprocessors into mission-critical situations?

A. Absolutely.

Q. Does Intel want to put lives at risk?

A. Of course not.

Q. Okay. You said that Intel started with just the two engineers in 1968. How many employees does Intel have today?

A. We have about 110,000 employees today.

Q. How many of those employees are working right here in

09:55 the United States?
09:55 A. Approximately half of those are in the United States.
09:55 Q. And where in the United States does Intel have these employees?
09:55 A. Well, we're all over, but our biggest locations are in Oregon, California, Arizona, New Mexico, Massachusetts and Austin, Texas.
09:55 Q. And in what other countries does Intel also have major manufacturing operations?
09:55 A. We have factories in Israel and Ireland as well.
09:55 Q. So if we might pull up the next slide, demonstrative DDX-4.5. What do we see here?
09:56 A. We're looking inside an Intel factory. We call them -- call them "fabs," short for "wafer fabrication." And so this is a very clean room filled with the equipment that manufactures all those transistors onto pieces of silicon.
09:56 Q. And this is, as you say, a type of factory?
09:56 A. Yes, it is.
09:56 Q. Can you tell us about Intel's presence here in Texas?
09:56 A. Sure. We've been in Austin, Texas for over 20 years now. We have 1,700 employees. Most of them are engineers working on product design.
09:56 We hire lots of engineering students from the University of Texas and Texas A&M. And, you know, we have a long relationship with Texas.

09:57 Q. Let's turn to our next slide. What is it that we see here on the screen?
09:57 A. This is the world's first microprocessor. This is the Intel 4004 that we introduced in 1971.
09:57 Q. So how large was the 4004?
09:57 A. It was pretty small. It was about the size of a coin.
09:57 Q. How many transistors did this first version have?
09:57 A. This had 2,300 transistors.
09:57 Q. And we'll be comparing that to what is there now, but how many calculations could it perform?
09:57 A. It could do 90,000 operations per second.
09:57 Q. So how did this 4004 microprocessor compare to the pictures that we were looking at from 1968?
09:57 A. They're very similar. So this processor could do about the same number of operations as one of those mainframe computers from just a few years before.
09:58 Q. So how is it that such a small chip can do the same work as a room-sized computer?
09:58 A. This comes back to the magic of the silicon integrated circuit, where the transistors instead of, you know, being big, discrete components, are actually printed microscopically into wafers of silicon.
09:58 Q. Does the number of transistors have any relationship to performance?

09:58 A. Sure, yeah. In general, the more -- with more transistors, you can deliver more performance and other features as well.

09:58 Q. Okay. After the release of the 4004, what did Intel work on next?

09:58 A. Well, we worked on a few more products. Probably the most significant next one was the 8086 that we introduced a few years later.

09:59 Q. And what was the 8086?

09:59 A. This was a microprocessor that was -- had much more performance than that 4004 that we just looked at. But it was also notable because that's where we introduced what we call the x86 instruction set architecture.

09:59 Q. Okay. And we'll be coming back to that. But moving forward in time, what was -- what marked the 1990s?

09:59 A. Well, we kept developing, you know, improvements to processors every year, but I would say in the '90s is when we came out with the product that made us a household name. That was the Pentium microprocessor. That was very popular in desktop computers.

09:59 Q. And the Pentium microprocessor, was this part of a continuation of this x86 line?

09:59 A. Yeah. So it built on the x86 instruction set architecture, which is basically, you know, like a language used for the microprocessor. But it had, you know, lots of

enhancements and improvements, so it had a lot more performance and a lot more features.

Q. Are the microprocessors that VLSI is accusing of infringing its patents part of this x86 architecture?

A. Yes. They are.

Q. How does the performance of Intel's more recent microprocessors compare to the performance of Intel's early microprocessors?

A. They have literally thousands and thousands of times more performance. They can do hundreds of billions of operations per second versus that, you know, original 90,000.

Q. Are you familiar with the term "Moore's Law"?

A. Yes. I am.

Q. What is Moore's Law?

A. Moore's Law was an observation made by Gordon Moore, one of our founders, that the industry was on a pace to double the number of transistors in a given area of silicon every 18 months or so.

Q. Okay. Let's take a look at a timeline on the next slide, DDX-4.7. What does this timeline, this slide show?

A. So this shows what we were just talking about. This shows our products -- some of our products through time and then how many transistors each one of them had. And you can see it, you know, it's kind of an exponential curve, and that's Moore's Law right there.

10:01 Q. Okay. So looking at these various microprocessors that are displayed here, how does the size of each of these microprocessors compare to each other? In other words, what kind of size are each of these?

10:01 A. They're basically the same size. We've kept the chip roughly the same size over the years but, you know, clearly put a lot more transistors into them.

10:02 Q. And how has Intel been able to keep the size of the chip the same while still putting so many more transistors in there?

10:02 A. This is because of our investments in manufacturing process technology, which is basically reinventing our factories every two years and coming up with a whole new set of new equipment that allows us to put more transistors into a given area.

10:02 Q. The jury has -- I think in passing it has already been explained -- heard a reference to process technology. What does that term mean?

10:02 A. That's really that -- I mean, that picture of the factory that we looked at earlier, that has a bunch of very specialized, expensive equipment that, like I said, every couple of generations we come out with a whole new set of equipment that has new capabilities to put more transistors into a given area.

10:03 Q. So what are the names that the jury will be hearing

about that's used by Intel to refer to its process technology?

A. We use kind of a numbering system that reflects the approximate size of a feature, like a transistor or a wire that connects them.

So, for example, 22-nanometers is the name of a -- what we call a process node or a generation of process technology. And that means that we can print roughly 22-nanometer-wide transistors.

Q. To give the jury some sense of the width of a 22-nanometer transistor, can you put that in perspective?

A. Sure. So if you took 22-nanometer transistors side-by-side, you could fit 4,000 of them across the width of a human hair. They're microscopic.

Q. And what is the current process technology that Intel is utilizing?

A. We're shipping 10-nanometer products in high volume today.

Q. Which are now less than half of the width of the 22-nanometer?

A. Yeah. That's right.

Q. Okay. So what is the result of this continuous increase in the number of transistors that fit into a microprocessor?

A. Well, with more transistors, you can design lots of enhancements and new features in your products. So our

engineers love it because now they have a lot more transistors to play with.

Q. Does Intel devote a substantial amount of resources to research and development, R&D?

A. Yes. We do. We spend almost 20 percent of our annual revenues on research and development.

Q. And does Intel focus its innovation efforts in particular areas?

A. Yeah. So I'd say there's kind of two big areas of investment. One is the manufacturing process technology that we talked about, and then the other is the product design or the product technology that uses all those transistors.

Q. Those are continuously operating simultaneously?

A. Yeah. That's right.

Q. Now, I want to ask you some questions about Intel's design process. Does Intel conduct research on what matters to consumers?

A. Yes.

Q. Have you read that research?

A. Yes. It's a key part of my job.

Q. And how do you and Intel utilize that research?

A. Well, we use that research to really understand what users care about, you know, what do they like and not like about their PC? What kind of improvements do they want to see? How do they use their PC? What kind of software applications

do they use, and what can we do to make those run better?

Q. Can you briefly describe for the jury the sequence of steps that Intel utilizes in designing and bringing to market a new microprocessor?

A. Sure. It really starts with that first step of understanding what customers want, and we get our inputs from lots of sources, from -- you know, from consumer surveys to direct feedback from our direct customers, like Dell and HP, other market research. And we kind of put that all together and say, okay. This is the product we really want to build.

And then we come up with a -- with engineering, we come up with a product concept, which is what's the idea of a product that best meets those needs.

And then once we've agreed on that, the engineers go to work, and they do the design. And essentially their job is to figure out where every last one of those billions of transistors should go.

And once they've done that and they've got a hardened design, they put it through our factory. We test and validate it. And if everything works like it's supposed to, we put it into volume production.

Q. Okay. So for each of these generations of microprocessors that we were looking at on the timeline a moment ago, how long does this sequence of steps take?

A. It can take anywhere from two to five years depending

on the complexity of the product.

Q. And how many Intel engineers and employees are working on the development of each of these microprocessors?

A. Well, you know, really it ramps up and down through time, but at its peak any given product could take up to a thousand engineers.

Q. So why does it take two to five years and up to a thousand engineers to build each of these new generations of microprocessors?

A. Well, because they're coming up with new innovations every generation. They're coming up with literally thousands of features and enhancements to improve the processor.

Q. Okay. So let's turn back to Intel's customers and the ultimate consumers. Why -- or let me ask it this way. What attributes matter to the direct manufacturers that you're selling to and the ultimate consumers?

A. Well, they care about a lot of different things, and it really matters -- it depends on what people are doing with the computers. So their needs can be highly variable, and people who are running or doing video editing for their job care about, you know, graphics performance. People who are doing video conferencing care about the camera quality. And so there's just a huge range of needs.

Q. Is performance an attribute that matters to various of these segments?

10:09 A. Sure. Among many other things and, you know, the performance matters to different degrees to different consumers depending on what they're doing with the computer.

Q. What about power? Is that an attribute that various segments care about?

A. Yes. For sure. Power is one of the many things that matters. Especially for, you know, people that are traveling a lot for work and want their laptop to last a long time without a power cord. People who do desktop gaming by contrast might not care as much about power efficiency.

Q. And are performance and power the only attributes that people care about?

A. No. There's a long list of other things they care about.

Q. So to be clear, the extent to which various segments care about different attributes varies among those different users?

A. Yeah. For sure.

Q. Who are Intel's competitors?

A. Our competitors include companies like AMD, Nvidia, Qualcomm, Huawei in China, ARM, and from a manufacturing standpoint TSMC, which is in Taiwan.

Q. So how do Intel's microprocessors compare to your competitors' microprocessors?

A. Well, I happen to think ours are the best.

10:10 Q. Are you familiar with a company called NXP?
10:10 A. I'm aware of NXP.
10:10 Q. How are you familiar with NXP?
10:10 A. Well, they're -- you know, they're a big company in the semiconductor industry, so I've heard of them.
10:10 Q. Are you -- have you heard of VLSI?
10:11 A. I have now.
10:11 Q. Had you heard of VLSI before this lawsuit got filed against Intel?
10:11 A. No. I had not.
10:11 Q. Okay. Mr. King, you should have, I think you took up there with you, three physical exhibits. Could you please show the jury -- pull out and show the jury DPX-17, the Haswell microprocessor?
10:11 A. Sure. That's a Haswell.
10:11 Q. And the Haswell microprocessor is one of the accused products in this case?
10:11 A. Yeah. That's correct. I'll show you the back too. You can see all the balls and pins that attach it to the circuit board.
10:11 Q. Okay. To take a step back. Why does Intel use names like Haswell?
10:11 A. Those are just code names that we developed to have an easy way to refer to the product.
10:11 Q. How does Intel come up with these internal code

names?

A. Well, that's changed quite a bit over the years. But for the past few years we've been choosing from a list of North American lakes.

Q. Okay. So if we can bring back up the slide, the timeline we were looking at just a moment ago. Could you please tell the jury -- looking as the red line starts to turn up, to the right there, we see the Haswell.

How many transistors are in the Haswell microprocessor?

A. So there -- you can see Haswell at the knee of the curve there, there's 1.4 billion transistors in that product.

Q. Okay. So let's look next at one of the other physical exhibits there in front of you, DPX-8, the Coffee Lake microprocessor.

A. Okay. This one's in a different box, but that's Coffee Lake.

Q. Okay. And this is also one of the accused microprocessors in this case?

A. Yes. It is.

Q. Looking here at this slide, how many transistors are in the Coffee Lake product?

A. There are 3 billion transistors in Coffee Lake.

Q. And then let's look at DPX-14, the third of those physical exhibits. That's the Ice Lake microprocessor, if you can hold that up for the jury.

10:13 A. Sure. This is Ice Lake. And this one doesn't have that metal tab on top, so you can actually see the die underneath.

10:13 Q. And is this also one of the accused microprocessors in this case?

10:13 A. Yes. It is.

10:13 Q. And looking here at this slide, how many transistors are in the Ice Lake microprocessor?

10:13 A. There are 7 billion in Ice Lake.

10:13 Q. And just to be clear, this continual increase in transistors means what?

10:14 A. This means that you can improve the products significantly every generation. You can add more performance, you can add more cores, you can add more features like graphics and other things.

10:14 Q. Okay. So let's follow up for a moment with regard to features.

10:14 Let me ask it this way: How many features are there in a given microprocessor product?

10:14 A. There are literally thousands of features in a microprocessor.

10:14 Q. So in addition to the two features that are accused by VLSI, have you prepared just a short snippet of the types of features that are in these microprocessor products?

10:14 A. Yes, I have.

10:14 Q. Okay. So if we can bring up the next slide, 4.8. What are we looking at here?

10:14 A. We're looking at just a few of the many thousands of features in a microprocessor.

10:15 Q. So just as an example, if we might highlight "hyperthreading technology." What is hyperthreading technology?

10:15 A. Hyperthreading technology is in an innovation that allows you to send two streams or threads of instructions to one core at the same time. So that for the person using the computer, that makes multitasking easier. So if you're doing many things at the same time, which most people are, it makes it smoother.

10:15 Q. Let's pull up just one more example, advanced vector extensions. What is that?

10:15 A. Sure. So advanced vector extensions, or AVX. This is an example of where we added to that x86 instruction set architecture that I mentioned earlier. And what these are are special instructions that process very large chunks of data which is very useful for demanding applications like scientific modeling and video editing.

10:16 Q. Okay. Mr. King, thank you.

10:16 MR. WREN: And we will pass the witness, Your Honor.

CROSS-EXAMINATION

BY MR. MANN:

10:17 Q. Good morning, Mr. King.
10:17 A. Good morning.
10:17 Q. My name's Mark Mann. We've never had a chance to meet before, correct?
10:17 A. That's right.
10:17 Q. All right. I understand that you are the representative for Intel as their corporate representative here today, correct?
10:17 A. That's correct.
10:17 Q. And that puts you in kind of a special position in that you're the spokesperson for Intel. You know that?
10:17 A. That's right.
10:17 Q. You know that things that you say can be binding upon Intel because of that position?
10:17 A. Yes.
10:17 Q. And so you understand the importance of your job here today to testify, correct?
10:17 A. Yes, I do.
10:17 Q. Can you tell me, if you don't mind, who is the CEO, chief executive officer of Intel?
10:17 A. Patrick Gelsinger.
10:18 Q. Okay. Do you know where he lives?
10:18 A. He lives in Oregon.
10:18 Q. All right. And do you know personally or by rumor whether he knows that you're here as the spokesperson for Intel

today?

A. I'm not sure. I haven't discussed it with him.

Q. Okay. Well, let's talk to you a little bit about -- when I talk to you, I'm talking to you as an individual and as a representative of Intel, okay?

A. Okay.

Q. First of all, you believe that the patent system in this country is important, don't you?

A. Yes, I do.

Q. You and Intel expect companies not to infringe on Intel's products, right?

A. That's correct.

Q. You agree that a company should not use other people's products or ideas without permission?

THE COURT: Mr. Mann, do you mean to say patents or products?

MR. MANN: I'm sorry?

THE COURT: Are you meaning to say products or patents?

MR. MANN: Patents. Patents. If I said products, I meant to say patents. Thank you, Your Honor.

BY MR. MANN:

Q. You agree that a company should not use other people's patented inventions without their permission?

A. Yes, I agree.

Q. And you agree that if a company is going to use

somebody else's patents and their products, there should be an agreement between them, correct?

A. Yes.

Q. Now, I listened to your testimony earlier about your educational background. But the fact is, the last 20 years that you've been at Intel, you've basically been in a nontechnical position, correct?

A. I think that's fair to say. I work very closely with our engineers.

Q. Okay. But as far as your job, you're not doing the everyday engineering. You're doing basically nontechnical, more business-related matters, correct?

A. That's correct.

Q. All right. You've never worked as a circuit designer?

A. No, I haven't.

Q. You've never worked as a computer architect, have you?

A. No, I haven't.

Q. You've never written source code for anyone, correct?

A. That's correct.

Q. Which would be the blueprints of products and how they're made, right?

A. Yes.

Q. All right. And you've never been on a research and

development group at Intel, have you?

A. No.

Q. You've never been named as an inventor for a patent?

A. I have not.

Q. And more generally, and I think this may be true, you've never invented anything, have you?

A. I've never invented anything for which there's a patent.

Q. Good point.

This case obviously concerns the '373 and the '759 patents. You don't have any technical expertise in those patents, do you?

A. No, I don't.

Q. All right. And you can't recall, I don't think, any specific patents that you've ever read through before this case came up, correct?

A. That's correct. I know I've read patents, but I couldn't recall specific ones.

Q. Okay. You talked a minute ago to Mr. Wren about Skylake and Broadwell and Haswell, those microprocessors, correct?

A. That's right.

Q. But you have not been allowed, or you have not looked at any of the source code that goes into those products, have you?

10:22 A. No, I have not.
10:22 Q. In fact, I'm going to guess, and you can correct me, that you're not allowed to look at the source code for those products, are you?
10:22 A. I don't think that's correct.
10:22 Q. So you can pull it up on the computer and look at the source code?
10:22 A. I don't have an account, if that's what you're asking. But if I asked to see source code, people would share it with me.
10:22 Q. Okay. But you have not looked at it, have you?
10:22 A. No, I haven't.
10:22 Q. All right. Now, you don't know the value, and you're not here to talk about the value of these patents in this case, are you?
10:22 A. No, I'm not.
10:22 Q. When Mr. Spehar -- you were here to hear Mr. Spehar testify first thing Monday?
10:23 A. Yes, I was.
10:23 Q. When he raised the issue about the importance of the patents and that he had looked at a source called Innography, were you curious enough to go look at that?
10:23 A. I have not looked at it.
10:23 Q. All right. Do you know what Innography is?
10:23 A. I've heard of it in passing.

10:23 Q. Okay. And have you heard of it there in Intel in passing?
10:23 A. I'm sorry. Could you restate?
10:23 Q. Sure. Have you heard of it, Innography, in Intel in passing?
10:23 A. Yes.
10:23 Q. All right. Let's talk a little bit about your career in the last number of years. You have traveled to speak to Intel customers around the world, correct?
10:23 A. Yes.
10:23 Q. You've spoken to customers in Europe?
10:24 A. Correct.
10:24 Q. In Asia?
10:24 A. That's right.
10:24 Q. You are in a job to try to convince people to buy and use Intel products, correct?
10:24 A. That's part of my responsibilities.
10:24 Q. Okay. You've been asked to speak at Intel conferences about Intel products, right?
10:24 A. Yes.
10:24 Q. Your job really has been to foster or to get people to want to buy Intel products, right?
10:24 A. That's a part of my responsibilities, I'd say more applicable to my previous role than my current role.
10:24 Q. Okay. You've been asked to represent Intel in public

matters talking about Intel products, correct?

A. Yes.

Q. All right. And do you remember when we asked you, or had a chance to talk to you back months ago, about what you were going to testify to in this case? Do you remember what you said?

A. I don't remember exactly. It was many months ago.

Q. If I told you -- does this help refresh your memory? You anticipated that you would "primarily be the face of the company." Does that refresh your memory?

A. That sounds familiar.

Q. All right. And what I wanted to ask: You were here during voir dire, correct?

A. I'm sorry. I missed the last part.

Q. You were here during voir dire when the jury was selected?

A. I was not here for jury selection.

Q. You weren't? Okay.

There was a question that came up several times, probably from both parties, that jurors got to raise their hand if they were the kind of go-to person in their family when you hooked up computers or did things like that. Okay?

A. Okay. I'm one of those as well.

Q. You're one -- you would have raised your hand, said I'm the go-to person in my family?

10:26 A. Yes.

10:26 Q. All right. When the call went out at Intel about the go-to person for these patents, you wouldn't have raised your hand that you're the go-to person for these patents, would you?

10:26 A. No, I would not.

10:26 Q. All right. And when that call goes out at Intel on the World Wide Web or whatever it may be, it would go to lots of places around the world. It wouldn't just go to Austin, would it?

10:26 A. I don't really know.

10:26 Q. Well, you had mentioned some places that Intel has offices, work. Do you remember, does Intel have production sites in -- I'm going to mispronounce these -- Leixlip, Ireland?

10:27 A. Yes.

10:27 Q. Jerusalem, Israel?

10:27 A. Yes.

10:27 Q. Kiryal Gat, Israel?

10:27 A. Yes.

10:27 Q. And you can correct me if I mispronounce these. Dalian, China?

10:27 A. Yes.

10:27 Q. Shanghai, China?

10:27 A. Shanghai is an assembly test factory.

10:27 Q. Chengdu, China?

10:27 A. Yes. Same thing.
10:27 Q. San José, Costa Rica?
10:27 A. I'm not sure about Costa Rica.
10:27 Q. Kulim, Malaysia?
10:27 A. Yes. Also an assembly test plant.
10:27 Q. Penang, Malaysia?
10:27 A. Same thing. Yes.
10:27 Q. Ho Chi Minh City in Vietnam?
10:27 A. Correct.
10:27 Q. And just to cut it through this, the -- Intel, the
10:28 50 percent of the employees that are not in the United States
10:28 are officing in over 100 places in the other parts of the
10:28 world, correct?
10:28 A. I don't know the exact number.
10:28 Q. And would 100 or plus offices sound correct to you?
10:28 A. It doesn't surprise me.
10:28 Q. All right. And everywhere, from Russia to China to
10:28 Vietnam to Canada, there are offices?
10:28 A. Sure. I mean, we have two people in a country. We
10:28 would call that an office.
10:28 Q. Correct. Okay.
10:28 So when the call went out for somebody to come to be the
10:28 face of the company here in Waco, Texas for this trial, when
10:28 you responded, you would have told folks if they asked you if
10:29 you were qualified to determine whether a U.S. patent was

10:29 infringed, you would have said, I'm not qualified?

A. That's generally true.

Q. Thank you, sir.

MR. MANN: I pass the witness.

REDIRECT EXAMINATION

BY MR. WREN:

Q. I want to very briefly follow up on just a couple of things, Mr. King, that you were asked about.

With regard to looking at the patents and talking to this jury about Intel's products as opposed to the patents, as we said, you're not the right one to talk about that, are you?

A. I'm not the right one to talk about the patents. I can talk about our products.

Q. As far as the question of patents and how the products are -- Intel products are actually designed, who is the jury going to be hearing from that are your colleagues? Who is Mr. Douglas?

A. Mr. Douglas is an Intel fellow that's the highest ranking of engineer at Intel who is an expert in this area.

Q. What about Dr. Rotem?

A. Same thing with Dr. Rotem. He's also an Intel fellow.

Q. And what about Mr. Borkowski?

A. He's a senior principal engineer. He's an expert on the source code.

10:30 MR. MANN: Your Honor -- excuse me, Mr. Wren.

10:30 Your Honor, I object. This is beyond the scope of the examination, and so I object to it for that reason.

10:30 THE COURT: Overruled.

10:30 BY MR. WREN:

10:30 Q. And then you were asked questions about offices that Intel has. Does it have those offices because it is actually producing product?

10:31 A. No. Many or most of those offices are sales offices.

10:31 Q. Okay. In connection with the sale of Intel products?

10:31 A. Correct.

10:31 Q. And are you familiar with VLSI having any offices?

10:31 A. No. I'm not.

10:31 Q. Okay. Thank you, Mr. King.

10:31 MR. WREN: We pass the witness.

10:31 MR. MANN: Nothing further, Your Honor.

10:31 THE COURT: You may step down.

10:31 THE WITNESS: Thank you, Your Honor.

10:31 THE COURT: Mr. Lee?

10:31 MR. LEE: Yes, Your Honor. Ladies and gentlemen, the next witness will be Jonathan Douglas.

10:31 THE COURT: Is he here?

10:31 MR. LEE: He's here, and Mr. Mueller will present him.

10:31 THE COURT: Very good. Thank you.

10:31 Mr. Mueller?

10:31 MR. MUELLER: Thank you, Your Honor.

10:32 (The witness was sworn.)

10:32 DIRECT EXAMINATION

10:32 BY MR. MUELLER:

10:33 Q. Good morning, sir.

10:33 A. Good morning.

10:33 Q. Could you please introduce yourself to the ladies and gentlemen of the jury?

10:33 A. Hi. My name is Jonathan Douglas. I live in Phoenix, Arizona. I'm a proud father of three kids, and I work at Intel Corporation.

10:34 Q. You might want to just put the microphone down a little bit closer. Thank you.

10:34 Sir, where did you go to college?

10:34 A. So I went to school at Rensselaer Polytechnic Institute.

10:34 Q. And what did you study?

10:34 A. So I had a -- I got a bachelor's degree in electrical engineering; studied electrical engineering and computer science.

10:34 Q. What year did you graduate?

10:34 A. I graduated in 1992.

10:34 Q. And after graduating in 1992, what'd you do?

10:34 A. So after I graduated, I went right to work for Intel.

10:34 Q. And have you been there ever since?

10:34 A. Yes, I've been there ever since.
10:34 Q. 28 years or so?
10:34 A. 28 and a half now.
10:34 Q. What is your current title at Intel?
10:34 A. So I am an Intel fellow.
10:34 Q. And can you tell the ladies and gentlemen of the jury what does it mean to be an Intel fellow?
10:35 A. Sure. So an Intel fellow and senior fellow, they're the highest technical ranks that you can achieve at the company. You get there by demonstrating excellence in your field of study, both internally and externally recognized.
10:35 Q. Now, to put that in context, about how many engineers work at Intel?
10:35 A. So I just found this actually last week. It was National Engineers week. And we have just over 70,000.
10:35 Q. And out of those 70,000 engineers, how many are Intel fellows?
10:35 A. Just over 100.
10:35 Q. And for how long have you personally been an Intel fellow?
10:35 A. Since 2017.
10:35 Q. Now, before you became an Intel fellow, what job positions did you hold over the years at Intel?
10:35 A. Sure. So before that I was a senior principal engineer. I was the technical director for power integration

in the microprocessor.

Before that I also worked in analog circuit design and validation and logic design and validation when I first started out.

Q. And, sir, if you could just give us a high-level summary of the types of responsibilities that you had in those positions.

A. So sure. So in those positions I would, you know, write source code, they call it, design circuits, validate the circuits, and then later I got into technical supervision and technical direction of engineers and also I did a lot of research and development.

Q. And could you summarize the types of products that you worked on over the years?

A. Sure. So since I started, I've worked on most of the major microprocessor families that Intel has designed and sold.

Q. Are you a named inventor on any U.S. patents?

A. Yes. I am.

Q. How many?

A. I think about 20 right now.

Q. Now, have you ever testified in a courtroom before?

A. No. I have not.

Q. I'd like to ask you if you could, sir, to look on that stand right beside you. There should be some exhibits, and there should be a actual physical plastic envelope.

10:37 A. Okay. Yes.

10:37 Q. There you go. That's labeled DPX-17. Could you just look inside that?

10:37 A. Sure.

10:37 Q. See what's --

10:37 A. Can I open it?

10:37 Q. You can open it.

10:37 A. Okay.

10:37 Q. What is it?

10:37 A. Okay. So this is an actual Haswell microprocessor, like what Intel would sell into, say, a desktop computer.

10:37 Q. So if you wouldn't mind, sir, if you would just kind of hold that up for the jury so they can at least get a little bit of a look at it.

10:37 Thank you. And that's a Haswell processor; is that right?

10:37 A. Yes. This, I believe, is the desktop version.

10:37 Q. Now, Haswell is a family of processors; is that correct, sir?

10:37 A. That's correct, yes.

10:37 Q. How many components are within that processor right in front of you?

10:37 A. So transistors, it's, you know, into the billions, but if you talk about components that do individual functions, there's literally thousands of them.

10:38 Q. And who designs the components in those chips?

10:38 A. So a team of architects, engineers and validators do the design of all those components.

10:38 Q. And if you could just give us a ballpark estimate for how many hours does it take to design a chip like that one right in front of you?

10:38 A. Sure. So, you know, the teams are, you know, 400, even up to a thousand. And these designs can take three to five years, so you're talking literally millions of hours of work.

10:38 Q. Why does it take Intel engineers so much time to develop a chip like that?

10:38 A. Sure. So, you know, there's these thousands of components. Each one of them is very specialized, and so it takes an engineer with the skill to do it, and so you have to put all these thousands of components together. You have to test them. You have to validate them. You have to design them, and eventually, you know, it gets shipped out, so it takes a lot of time.

10:38 Q. And if you could, sir, if you could give us an explanation at a high level of the stages of development of an Intel microprocessor like the ones you personally have worked on.

10:39 A. Sure. Yeah. So really it actually starts at figuring out what the customer is going to want in a product. From there, we have a team of architects, so they draft up

10:39 essentially specifications for what components, like the number
10:39 of cores or the amount of graphics that has to be in there.
10:39 They will turn that over to a group of circuit and logic
10:39 designers that will do the actual design then.
10:39 There has to be physical layout that happens, and then
10:39 after that, they have to send the chip off to the fabrication
10:39 facility so the process itself is very involved.
10:39 Q. And how long in total do these stages take?
10:39 A. So in total, anywhere from three to five years or
10:39 more.
10:39 Q. I want to focus on the Haswell processor family,
10:39 including the chip that you have in front of you. Okay. Do
10:39 you have that in mind?
10:39 A. Yes.
10:39 Q. What role did you personally play in the development
10:40 of the Haswell processors?
10:40 A. Okay. So I was the lead for the development of the
10:40 integrated power circuits that went in the processor along with
10:40 being an expert circuit designer and reviewer for many other
10:40 areas of the microprocessor.
10:40 Q. As part of your personal work on the Haswell
10:40 processor, are you familiar with something in that chip called
10:40 the C6 SRAM?
10:40 A. Yes. I am.
10:40 Q. What is SRAM?

10:40 A. So SRAM, it's an acronym that -- it stands for basically memory. It's where you can store some information, like you might, you know, write something in a journal.

10:40 Q. What is the C6 SRAM in that Intel chip?

10:40 A. Okay. So the C6 SRAM, it's a place where you can store information when the processor needs to go to a low power state.

10:40 Q. And what type of information would you store in that low power state?

10:41 A. So you would store the information that the processor would need to wake back up from that state quickly.

10:41 Q. Sir, I'd like you to turn, if you could, to Exhibit D-27 and, Your Honor, if I could ask that the public monitors be turned off and just the jurors' monitors be kept on.

10:41 A. So this binder here? I'm sorry. Which one?

10:41 Q. It's Exhibit D-27.

10:41 A. Okay. I have that.

10:41 Q. And, sir, do you recognize this document?

10:41 A. Yes. I do.

10:41 Q. This is an internal Intel document; is that right, sir?

10:41 A. That's correct.

10:41 Q. And it's a secret document, right?

10:41 A. Yes. It is.

10:41 Q. It contains confidential information?

10:41 A. Yes. It does.
10:41 Q. What is this type of document -- at a very high level, what is this type of document for at Intel?
10:41 A. Okay. So this is what's called a microarchitectural spec, so that would be a document that that team of architects would give to the designers kind of telling them in words, essentially, technical words how they want the design of the processor to be.
10:42 Q. And when architects like you and other folks at Intel come up with the architecture, what's done with it next?
10:42 A. So that is given to the team of circuit and logic designers and they produce the circuits and the logic necessary to perform those functions.
10:42 Q. Would that design process include something called "P-code"?
10:42 A. Yes. It would.
10:42 Q. What is P-code?
10:42 A. So P-code is -- it's like directions. It's a type of instructions that are contained inside the microprocessor.
10:42 Q. We're going to hear from somebody later in this trial who's going to testify about P-code?
10:42 A. Yes.
10:42 Q. Who's that?
10:42 A. Mr. Borkowski.
10:42 Q. Let's turn to Section 4.7 on Page 39.

10:42 And, sir, do you see there's a section here labeled "Power Supply Mux"? Do you see that, sir?

10:42 A. Yes. If you give me one second.

10:43 Q. Sure. Take your time.

10:43 A. Okay. Yes. I'm there.

10:43 Q. Power supply mux, do you see that section?

10:43 A. Yes. I do.

10:43 Q. At a high level, what is that describing?

10:43 A. So this is describing -- a mux is like a switch. It can kind of switch between two different sources of power, you know, maybe like electric versus gas in a hybrid, right? And so this is specifying a mux for the C6 SRAM that can switch between two different sources of power for that SRAM circuit.

10:43 Q. So if you'd just be a little more specific, what is the relationship between this mux or switch on the one hand and the C6 SRAM on the other hand?

10:43 A. Sure. So this mux is actually providing power to a portion of the SRAM called the "bit cells."

10:43 Q. And when you say "power," is that electricity?

10:43 A. Yes. That's electricity.

10:43 Q. We can take this document down.

10:43 When did Intel finalize the design for the C6 SRAM in Haswell?

10:44 A. So the design and architecture was set by around 2008.

10:44 Q. Now, are you familiar with another family of processors called the "Broadwell family of processors"?
10:44 A. Yes. I am.
10:44 Q. And what was your personal involvement in that family?
10:44 A. So that came after Haswell. And again, I was the lead for the power integration and also a lead circuit designer and reviewer.
10:44 Q. What was the -- how did the C6 SRAM in Haswell compare with the C6 SRAM in Broadwell?
10:44 A. They were substantially the same.
10:44 Q. Now, what is the relationship between this C6 SRAM in the Haswell and Broadwell processors and power savings? What's the relationship between the two?
10:44 A. Okay. So the C6 SRAM, again, it's used to hold information when the part goes to sleep. And when the part goes to sleep, then you can save power on those domains that are going to sleep.
10:45 Q. And are there other features that impact power savings in these processors, these Intel processors?
10:45 A. Yeah. There's literally hundreds. You know, we redesigned the interfaces for lower power. We did re-architecting to allow better entry into these states. We changed it so that the clock could operate at a lower frequency. So there's many, many, many different power savings

that went on.

Q. Now, sir, I'd like to ask you a few questions about the details of how this chip architecture worked. Okay. Do you have that subject in mind?

A. I do.

Q. Within the Haswell and Broadwell processors, okay?

A. So for those specific processors?

Q. That's right.

A. Yes.

Q. So let's take a look at DDXF.2.

A. Is this in my binder?

Q. It's just on the screen, sir. It's not in the binder.

A. Oh, okay. I'm sorry.

DEPUTY CLERK: Counsel, is it okay for everyone to see?

MR. MUELLER: Yeah. I'm sorry. I should have said that. This is fine for the public to see too.

BY MR. MUELLER:

Q. Mr. Douglas, can you explain what we see here?

A. Sure. So I can kind of hold this back up.

So if you were to actually pop that silver lid off there, you would see something that looks very much like this. This is actually a photograph of the chip itself that's underneath that silver lid.

Q. And when you say what you're holding up, that's

labeled DDX -- or DPX, I should say, 17; is that right?

A. Yes. Correct. The Haswell processor.

Q. And if we look inside DPX 17, we see something like this?

A. Yes.

Q. Now, if you could, sir, the screen there is a touch screen, and I think there's a button on the bottom that allows you to highlight.

A. Yes. I see that.

Q. Okay. If you could press that button, please, and circle for the jury about where the C6 SRAM would be located in the Haswell processor.

A. Sure. So at this level, it would actually be pretty hard to see. But it would be, you know, the one for the core would basically be just roughly in that vicinity where I drew it there for each core.

Q. Now, is there a term for the group of components within which the C6 SRAM is located?

A. Yeah. We refer to that as "the ring."

THE COURT: I'm sorry. I just couldn't hear you.

BY MR. MUELLER:

Q. I believe you said "ring"; is that right?

A. Yes. They're a ring.

Q. And are you familiar with the term "domain"?

A. Yes. I am.

10:47 Q. Is there a ring domain in these Intel chips?
10:47 A. Yes. There is a ring domain.
10:47 Q. So, sir, I'd like to, if we could, go through exactly how some of the components within this architecture in the Intel chips work. Do you have that subject in mind?
10:47 A. Yes. I do.
10:47 Q. And I'm going to try to use --
10:47 MR. MUELLER: Your Honor, may I use the document camera here?
10:48 THE COURT: Of course.
10:48 BY MR. MUELLER:
10:48 Q. Okay. This is DDX-5.4, and I'll just show the jury. It's just a magnet board that we're going to put some components on to see exactly how they work.
10:48 THE COURT: Counsel, let me ask you this: I was going to take a very short break just because we got started late. Would this be a -- I'm trying not to interfere with what you're doing with this --
10:49 MR. MUELLER: Absolutely, Your Honor. It's a good time to take a break.
10:49 THE COURT: Okay. Ladies and gentlemen, we're going to take just like a ten-minute break, just because we've been going a while. Remembering my instructions not to discuss this case amongst yourselves, you may be dismissed. We'll see you back shortly.

10:49 THE BAILIFF: All rise.
10:49 (Jury exited the courtroom at 10:49.)
10:49 THE COURT: Did we have anything to take up?
10:49 MR. LEE: Not for Intel, Your Honor.
10:49 MR. CHU: Not for us. Thank you.
10:49 THE COURT: Okay. Very good. We'll be back in a few minutes.
10:49 (Recess taken from 10:49 to 11:04.)
11:04 THE BAILIFF: All rise.
11:04 THE COURT: Please remain standing for the jury.
11:04 (The jury entered the courtroom at 11:00.)
11:04 THE COURT: You may be seated.
11:04 Mr. Mueller, you may continue.
11:04 MR. MUELLER: Thank you, Your Honor.
11:04 BY MR. MUELLER:
11:04 Q. Mr. Douglas, I just want to take us back to DDX-5.4, and this is that board that we can see on the screen, okay?
11:05 A. Yes.
11:05 Q. And again, this shows some components that are actually in the Intel Haswell processor; is that right, sir?
11:05 A. That is correct.
11:05 Q. And I want to start with the four blue squares here at the top, Core 1, Core 2, Core 3, Core 4. What are those?
11:05 A. Sure. So when Haswell -- this is -- one of our SKUs had four cores. These actually run the instructions from the

operating system, like Microsoft Windows. So they're the things that actually do the work in the microprocessor.

Q. Now, you referred a little while ago to the ring domain; is that right, sir?

A. Yes.

Q. Is that the same as what we see here, this ring domain?

A. Yes. For Haswell. Yes. That would be the ring domain.

Q. And can you remind us again what that is?

A. So the ring domain is -- it's a collection of circuits that are on one voltage or power source. And that's how the cores communicate to each other and then communicate to, say, the outside world.

Q. So I have some other components that I want to put on this board one by one and ask you what each of them as a factual matter does, okay?

A. Okay.

Q. Now, let me start with this: It's an orange block that says "Graphics"?

A. Yes.

Q. What is that?

A. So that would be the block that's responsible for displaying images on your screen, like if you're playing a computer game.

11:06 Q. And within this diagram, where should I put this?
11:06 A. You can just kind of tuck that up into the right there. That's perfect.
11:06 Q. Next up I have something, this green rectangle, "last-level cache (LLC)." What is that?
11:06 A. So like before, we had talked about SRAM is a memory that can store things. So that is a big block of memory that can store information that all of the cores can use. And it's in the ring domain, so you would want to place that, say, down at the bottom there.
11:07 Q. This purple rectangle, "Interface/CBO," what is that?
11:07 A. Sure. So those are acronyms, but at a high level, that's the mechanism by how the cores actually talk to that last-level cache, that memory.
11:07 Q. And where should I put that?
11:07 A. You can just put that at the top, you know, right at the very top there. Yep.
11:07 Q. Here's a gray rectangle, "Buffers/FIFO," what is that?
11:07 A. So again those are, you know, kind of acronyms, but they're just basically ways that that ring domain can actually talk to the outside world besides the cores.
11:07 Q. And where should I place that in this diagram?
11:07 A. So you can place that in the white area, kind of off to the right there.

11:08 Q. Next up we have "Supporting Circuitry." What is that?

11:08 A. So this is just miscellaneous components that are needed to run the ring, like the clock circuitry, thermal sensors and other components. And you can just place that in that remaining white space there.

11:08 Q. Now, to be clear, is this all drawn to scale?

11:08 A. No. This is -- the die photo that you showed earlier is actually to scale. This is sort of just a representation in blocks that's not to the same scale.

11:08 Q. Next up we have the "C6 SRAM." Is this what we've talked about a bit?

11:08 A. Yes. It is.

11:08 Q. And remind us one more time, what is it?

11:08 A. So that is a memory that can hold information for one of the cores when it needs to go to a low power mode.

11:08 Q. And where would it be located here?

11:08 A. So that would be one associated one -- with one of the cores. So you can just tuck it up at the top, you know, 11:09 maybe next to Core 4 there. And, you know, it's a little bigger than it would be normally, I think. There's about a 50x 11:09 size difference there, but -- otherwise you wouldn't be able to read it.

11:09 Q. When you say "50x size difference," you're comparing the C6 SRAM to what?

11:09 A. To the last-level cache.
11:09 Q. This big green rectangle?
11:09 A. Yes.
11:09 Q. Now, everything that we put down here so far, starting with this purple rectangle and going down below, this is all within the ring domain; is that right, sir?
11:09 A. That is correct.
11:09 Q. And how does each of these components in the ring domain receive power during operation?
11:09 A. Sure. So in Haswell, we actually integrated a power source right in the die. And so there's one of those power source blocks, we call it FIVR, fully integrated voltage regulator, and that would provide the power for that ring domain.
11:10 Q. So I have here a component labeled "VCCR." What is that?
11:10 A. So that's an acronym. It really just stands for voltage for the ring domain. That's why it's VCCR. And that would represent the regulator that supplied power to the ring domain.
11:10 You can stick that, you know, kind of off to the right. Right about there, yep.
11:10 Q. And is that a type of FIVR?
11:10 A. Yes, that is.
11:10 Q. Next we have VCCIO. What is that?

11:10 A. So that is another type of regulator like we had been talking about. And that supplies power to a lot of things that aren't actually shown on this diagram. But that will also supply power to the power supply mux that we had talked about earlier for the C6 SRAM.

11:10 So you can, you know, put that maybe down below a little bit -- a little bit more down there, because we have to add another component.

11:11 Q. Next, sir, we have a component that looks sort of like a dial. What is that?

11:11 A. So that would actually represent that power mux or switch. Looks like a dial because you can literally just switch between two different sources of power. And in this case -- yep, you put it right there because it can switch between those two.

11:11 Q. And before we keep going, just to make sure we're clear here, this VCCR power supply supplies the entire ring domain; is that right?

11:11 A. That's correct.

11:11 Q. And the VCCIO power supply, what does that supply power to?

11:11 A. It supplies power to the power mux, and then a bunch of other components that we don't have here, how the chip talks to the outside world.

11:11 Q. But one of the things it supplies power to is the C6

11:11 SRAM?

A. Yes. Through the mux, that's correct.

Q. Is it just for the C6 SRAM?

A. In this particular block, that is correct.

Q. Now, how many power supplies are there in total in the entire Haswell processor?

A. I believe Haswell has ten different power supplies integrated.

Q. We're just looking at two of them?

A. Yes.

Q. Next, sir, we have a pink rectangle here, PCU. What is that?

A. So the PCU, we call it power control unit or sometimes package control unit. And that actually controls all of the power functions in the processor, voltage and frequency. And it also controls the operation of that switch that you have there. So you can place that next to the switch.

Q. Now, when these power supplies are not being used and some of the components are powered down, what happens?

A. So if a power supply is not being used, its voltage is off. It's kind of floating.

And then the components that are on it can't actually do anything because they're not receiving any power.

MR. MUELLER: Your Honor, before I go further, I just want to label this completed board as DDX-5.5.

11:13 THE COURT: And it's a demonstrative, correct?
11:13 MR. MUELLER: Yes, sir.
11:13 BY MR. MUELLER:
11:13 Q. So, Mr. Douglas, I want to ask you some details about, as a factual matter, how this works, okay?
11:13 A. Okay.
11:13 Q. How does the PCU right here interact with the C6 SRAM box?
11:13 A. Okay. So the PCU has a command that it can issue that essentially switches a wire that goes to the mux, and it can cause it to change from one with power source to another power source.
11:13 Q. Now, the mux is represented by this dial right here?
11:13 A. That's correct.
11:13 Q. When the ring domain is powered on using the VCCR -- actually, sorry. Why don't we do it this way. If you'd use your touch screen again.
11:14 A. Sure.
11:14 Q. And why don't you show the ladies and gentlemen of the jury how power supply works in this architecture when the VCCR is supplying power?
11:14 A. Sure, yeah. So it's supplying electricity like a wire might in your house. And so what I'm going to do is draw, you know, just a line that's kind of going -- well, it's kind of tiny -- over to the ring. And I drew it into that gray box.

11:14 It's actually going to everything in there.

And then also power would flow to the switch. You can see that switch is in the up position pointing to the VCCR. And then it would flow from the switch into the C6 SRAM.

Q. Now, are there instances where the switch is flipped?

A. Yes, there are.

Q. And when would that happen?

A. So that happens when the processor goes into a power-savings mode. Sometimes we call them sleep modes.

Q. What causes the switch to flip?

A. The switch will be flipped when the PCU, you know, essentially it receives instructions and knows that it can go into one of these sleep modes. And when it can do that, then it will the flip that switch.

Q. Now, sir, if you could take down whatever writing you have on the touch screen. And let's flip the switch to the VCCIO. And if you could show the ladies and gentlemen of the jury using the touch screen what happens when the switch is flipped.

A. Sure. So I'll do a different color here. So when the switch is flipped, power's flowing from the VCCIO through the switch to the C6 SRAM. But I'm not drawing a line because no power is flowing from the VCCR to the rest of the ring.

Q. You can take that writing down. I'm going to ask you a couple more questions. Let's flip it back to the VCCR.

Sir, is the amount of power supplied by the VCCR to the ring domain always the same?

A. No, it's not.

Q. Why not?

A. So just very much like a person can walk and they can run and they can sprint, there's different amounts of things that you need to do in the ring. So if you don't need to do much, it might go at kind of a walking speed, that's less power.

If you need to do a whole bunch, like you need to get somewhere fast, you might sprint. And then that's going to supply a whole lot of power to the ring.

Q. Different power supply levels?

A. Different voltage levels and different amounts of power, yes.

Q. And what are the variables in analyzing the power supply levels for the VCCR?

A. Sure. The two primary variables are voltage, that I had mentioned. That's the electrical voltage level it's at. Like, say, 12 volts from your car battery, right? And then frequency, which is what frequency or clock speed that the ring is operating at.

Q. Sir, I want to ask you about the facts with respect to these power supply levels from the VCCR, okay?

A. Okay.

11:17 Q. Now, I'm going to put this board aside for a moment. And I want, if you could, to give -- I'd like to ask you to give the ladies and gentlemen of the jury some examples of power supply levels fed by the VCCR. Do you have that in mind?

A. Yes.

Q. So what is one example you can give us?

A. Sure. So the --

Q. I'm sorry. Before I start, let me just sketch those same two variables that you mentioned.

A. Sure. I was going to tell you to do that.

Q. So you said voltage and frequency?

A. Yes.

Q. Okay.

A. Okay. I think it's slightly off the camera. They can't see the bottom.

Q. There we go.

A. Good.

Q. All right, sir. So this shows voltage going up and frequency going up. Do you see that?

A. Yes.

Q. So within this, can you give us one example of a power supply level from the VCCR?

A. Sure, yeah. So one level it can operate at is if I mentioned that like the walk speed, that lowest power level, and we would actually call that -- for shorthand we would call

that VF 0 for the lowest voltage frequency.

Q. Is that sometimes called ring RF voltage zero?

A. Yes, that's correct. Yeah.

And so don't place it on zero, because it's not zero. Just place it up and to the right there. Yes.

Q. So I've written "Ring_VF." "Ring_VF_Voltage_0." Do you see that, sir?

A. Yes.

Q. What is that?

A. So that is the lowest operating voltage and frequency for the ring when it doesn't have much work to do.

Q. Can you give us another example of the power supply level in the VCCR?

A. Sure. So we can move on to, say, the running speed when we have a fair amount of work that we want. And so you could put another dot up and to the right.

Q. And what is that?

A. So that we could call "ring_VG_voltage_0." That's where I can sustain a fair amount of work going on in the ring.

Q. What is Ring_VF_Voltage_1 used for, sir?

A. So again, that's used for when the ring has a fair amount of work to do for a long amount of time.

Q. And how do the voltage and frequency of Ring_VF_Voltage_1 compare to the voltage and frequency of Ring_VF_Voltage_0?

11:20 A. They are both higher.
11:20 Q. Can you give us another example of a power supply level in the VCCR?
11:20 A. Sure. We can go to that sprint level that I was talking about. And so you can draw another dot quite a bit higher in voltage and just a little bit higher in frequency there. And then again, you can label that Ring_VF_Voltage_2.
11:20 Q. And what is that used for?
11:20 A. So again, like sprinting, that's used for when you have an awful lot of work to do for a fairly short amount of time, so again higher in voltage and higher in frequency.
11:21 Q. Higher frequency and higher voltage compared to the other two levels?
11:21 A. That's correct.
11:21 Q. Now, these power levels, how are they actually stored in the circuitry of Intel chips?
11:21 A. So that information is stored in a type of memory we call fuses.
11:21 Q. What is a fuse?
11:21 A. So a fuse -- it's not like what you have in your house. It's a type of memory that can store information, but it never loses its value even if it's removed from power.
11:21 Q. So let me go back to DDX-5.5 for just a moment. And, sir, if you could, using the touch screen, could you show us where power levels that we just looked at come from in this

11:21 circuit diagram?

11:21 A. Sure, yeah. So again, the power itself is coming from the VCCR over to the ring domain. And then the control for the voltage and the frequencies that you want to operate, that is actually coming from the PCU, right? So it's going to control the voltage for that VCCR ring. And then the frequency is going to go into that supporting circuitry there.

11:22 Q. So there's three power supply levels that we just looked at, Ring_VF_Voltage_0, Ring_VF_Voltage_1, Ring_VF_Voltage_2. Are those actually output to the ring domain during operation?

11:22 A. Yes. Those voltages are actually output and then those frequencies are actually used by the clock.

11:22 Q. And is the ring domain and the components in it operational when those voltages are supplied?

11:22 A. Yes. Fully operational.

11:22 Q. Now, I think you may have touched on this earlier, but ring_voltage_0, does that mean zero electricity?

11:22 A. No, it doesn't. We just number them sequentially zero, one, two. It's actually at a specific voltage.

11:22 Q. Now, are you familiar -- well, withdrawn.

11:22 We just talked about the C6 SRAM and the components in it. The additional components in the ring domain in the Haswell processor, right?

11:23 A. Yes.

Q. How does that compare with the Broadwell processor?
A. So you could use this exact same diagram for the Broadwell processor.
Q. And in the Broadwell processor, does the VCCR supply -- looks like the diagram may not be coming up here. I'll just hold it up to make sure. Does the VCCR supply these same power levels to the ring domain in the Broadwell processor?
A. Yes. It does.
MR. MUELLER: And, Your Honor, I'm going to label this as a demonstrative, DDX-5.6.
THE COURT: Okay.
BY MR. MUELLER:
Q. Now, was Haswell the first Intel product to include a C6 SRAM?
A. No. It was not.
Q. How many earlier generations of Intel products included a C6 SRAM?
A. The Penryn family of microprocessors and its derivatives and the Nehalem family of processors and its derivatives.
Q. And when did Intel first design the Penryn microprocessors that contained a C6 SRAM?
A. That design started in around 2004.
Q. And what was the design of the C6 SRAM in Penryn?

A. So the C6 SRAM again was similar. It was a small bit of memory that could store information.

In Penryn that SRAM was permanently connected to their IO supply and didn't have a mux associated with it.

Q. And in Nehalem when did Intel design the C6 SRAM feature in that family of processors?

A. So that was started in 2004 to 2005.

Q. And what was the design of the C6 SRAM in those chips?

A. So in those chips they also had a small amount of memory dedicated for the C6 functions. They had a power switch which functioned substantially similar to a power mux from the Uncore voltage there and then a gated version of the Uncore voltage.

Q. So as a general matter, how did the C6 SRAM design in Broadwell and Haswell on the one hand compare to the C6 SRAM in the earlier Penryn and Nehalem processors on the other hand?

A. It served the same purpose across all of those.

Q. In Penryn and Nehalem, could the C6 SRAM retain data while the other components in the processor were powered down?

A. Yes.

Q. In Penryn and Nehalem, could the cores all be powered off?

A. Yes. They could.

Q. So in Penryn and Nehalem, C6 SRAM could retain data

while the core and other components were powered off?

A. Yes. That's correct.

Q. And that was without an SRAM power multiplexer?

A. For Penryn and then Nehalem had the power switch, which was similar but not quite the same.

Q. Now, has Intel been using sleep states and chips even before Haswell and Broadwell?

A. Yes.

Q. For how long?

A. I remember back as far as Penryn again, so Penryn and everything after that had these sleep states implemented.

Q. Now, sir, I'd like you to focus, if you could, on some products that came after Haswell and Broadwell, the Lake series processors. Do you have those in mind?

A. I do.

Q. Those are named after various lakes in North America?

A. Or elsewhere in the world. I don't know exactly.

Q. And do those products have C6 SRAM?

A. Yes. They do.

Q. Do those products use sleep states?

A. Yes. They do.

Q. Do those products have something called a Package C7 sleep state?

A. Yes. They all do.

Q. Now, those products are not accused by VLSI of

11:27 infringing the '373 patent, are they?
A. That's my understanding.
Q. Now, in these processors that we're talking about, let's focus on Haswell and Broadwell. Do you have those in mind?
A. I do.
Q. Is there a retention voltage in those chips?
A. There is.
Q. What is it?
A. So that's the voltage where the entire ring domain can just idle.
Q. I'm sorry?
A. It's where the entire ring domain can just sit idle.
Q. What does that mean "to be idle"?
A. Just like you would idle your car. You know, you're just sitting there not really doing anything.
Q. For the Haswell and Broadwell processors, did you and your colleagues identify the lowest retention voltage for the C6 SRAM?
A. No.
Q. Why not?
A. So Intel has to ship out hundreds of millions of these units, and it can take a lot of time, you know, in that process for each unit when it manufactures it.
And so if you remember, I talked about there are thousands

of components in there. So it's literally not practical to go to every single component and try and find, you know, where it might work and where it might not work. So everything is basically tested as the entire domain for whether it works or not.

Q. Now, sir, you were aware of a fuse -- remind us again what a fuse is.

A. Sure. A fuse is just a type of memory that stores information that -- it keeps its value even if power's taken away.

Q. And are you aware of a fuse in these chips called the RING_RETENTION_VOLTAGE?

A. Yes. I am.

Q. What is it?

A. So that's the voltage that the PCU can set the ring at in the Package C3 state when it's idle, it's not doing anything.

Q. What is the relationship between the RING_RETENTION_VOLTAGE and C6 SRAM in these chips?

A. There's none.

Q. Now, let me go back to DDX-5.6 for a moment and put on the -- these are the power supply levels from the VCCR; is that right, sir?

A. Yes.

Q. And do you know how the RING_RETENTION_VOLTAGE

compares to these from a power supply level perspective in these chips?

A. Yes. I do.

Q. I'm going to add a plastic overlay here, and if you could, sir, could you tell me where to draw the RING_RETENTION_VOLTAGE fuse value on this graph here?

A. Sure. So it's when the ring's idle so there's not really a frequency associated with it so you could just draw a line -- just draw a line like right underneath that Ring_VF_Voltage_1, a little higher.

Q. Right there?

A. Yeah.

Q. Did I draw that accurately on DDX-5.6?

A. Yes.

Q. And from a perspective of frequency, is the RING_RETENTION_VOLTAGE power level higher or lower than the Ring_VF_Voltage_0 level?

A. Sure. So that voltage level is higher.

Q. From a voltage perspective, is RING_RETENTION_VOLTAGE level higher or lower than Ring_VF_Voltage_0?

A. The voltage level is higher.

Q. And in terms of power levels actually used by this C6 SRAM, what is the lowest power level?

A. That's that Ring_VF_Voltage_0.

Q. This one here at the bottom?

11:31 A. Yes.
11:31 Q. Now, let's go back to DDX-5.5, but before we do, I just want you to keep in mind, sir, I'd like to ask you a few questions about when the chip is in Ring_VF_Voltage_0 level. Do you have that in mind?
11:31 A. I do.
11:31 Q. So we're going to back to DDX-5.5. When the VCCR is supplying Ring_VF_Voltage_0, what is happening within the ring domain?
11:31 A. Sure. So the ring is actually operational. It's fully operational when that voltage and frequency are being supplied, so it's doing whatever it's -- you know, has to do or been instructed to do.
11:31 Q. And when the ring domain is operating at Ring_VF_Voltage_0, what's happening in the C6 SRAM specifically?
11:32 A. So in that case, again, that switch is going to be up, right? So the power's going to be coming from VCCR, and if one of the cores is going to go to sleep, when it's at VF_VOLTAGE_0, it will save its information into that C6 SRAM.
11:32 Q. Back to DDX-5.6. Now I want to ask you some questions about the RING_RETENTION_VOLTAGE power level. Do you see that, sir?
11:32 A. Yes.
11:32 Q. What is the relationship between the

11:32 RING_RETENTION_VOLTAGE power level and the C6 SRAM power
11:32 multiplexor function shown in this chip architecture?
11:32 A. There's no relationship.
11:32 Q. What is the relationship between the PCU in this chip
11:32 architecture and the RING_RETENTION_VOLTAGE fuse value?
11:33 A. So the PCU can send that value to set the ring
11:33 voltage at when the ring is in this package C3 state.
11:33 Q. How, if at all, does the RING_RETENTION_VOLTAGE fuse
11:33 value impact the PCU's multiplexer operations?
11:33 A. As you see I've shown here, that switch, not at all.
11:33 Q. And why is there no relationship at all?
11:33 A. Because that switch is only turned when the processor
11:33 is going into that Package C7 state when there's going to be
11:33 nothing going on in the ring.
11:33 Q. So let's make sure we're clear with the ladies and
11:33 gentlemen of the jury. What specifically causes the PCU to
11:33 switch the VCCR or the power supply from the VCCR to the VCCIO?
11:33 What in particular causes that switch?
11:33 A. Yeah. So it's when the PCU wants to put the part
11:33 into Package C7, it will send the command to turn that switch.
11:34 Q. So can you just explain the sequence of events that
11:34 causes that to happen?
11:34 A. Sure. Yeah.
11:34 So when the PCU is -- knows there's nothing going on in
11:34 the chip and the cores are all asleep, and it sees that the

ring doesn't have to do anything either, it can start the sequence.

So first what it's going to do is it's going to shut off the clocks in the ring domain so that nothing can happen. Then it's going to bring that VCCR voltage down to zero and off and -- excuse me. Sorry.

Backing up, prior to that it's going to turn that switch from VCCR over to VCCIO, and then it's going to turn that VCCR supply off.

Q. How many times per second will the processor go into Package C7?

A. It really depends on what's going on, but it can happen, you know, a few times a second.

Q. Not hundreds of times per second?

A. No. That would be very unlikely.

Q. Now, what happens to the VCCR during this Package C7 sleep state?

A. Yeah. So the VCCR has been brought down to zero, and then it is shut off so it's not providing any power to the ring domain.

Q. Now, sir, are you familiar with the term "float"?

A. Yes. I am.

Q. What is the relationship between -- well, let me back up. What does float mean?

A. So float in this case is not like in the pool. It

11:35 means the voltage has no power or voltage connected to it, the wires, and so they're essentially floating at some indeterminate voltage. You don't know what the voltage could be.

Q. Does the VCCR float in Package C7?

A. Yes. It does.

Q. And what does that mean with respect to that component?

A. So for the components on the ring, they can't be operational because the voltage is not at any determinate value.

Q. Is the VCCR supplying a reliable voltage in that scenario?

A. No. Not at all.

Q. And what happens to all of the other components in the ring domain, other than the C6 SRAM, in this Package C7 state?

A. So they have been shut off and they're not functional.

Q. And how long does it take for the VCCR itself to be turned off?

A. It's about half of a microsecond. So a microsecond is one-millionth of a second.

Q. During that half of a millionth of a second, is the VCCR providing a reliable voltage to the ring domain?

11:36 A. No. It is not.
11:36 Q. Now, is any part of this process referred to as a ramp?
11:36 A. Yeah. The process where the voltage goes from where it's operational down to that floating state is called a ramp.
11:36 Q. Is the VCCR regulating during the ramp-down?
11:36 A. No. It is not.
11:36 Q. Why not?
11:36 A. Because it's not providing a stable voltage or any power to the domain. In fact, it's taking charge off of the domain.
11:37 Q. And what happens to the circuits in the ring domain during the ramp?
11:37 A. Again, they have been turned off, so they are not functional.
11:37 Q. Are they receiving a regulated voltage in that time period?
11:37 A. No. They are not.
11:37 Q. Now, let me shift gears a bit. And I want to ask you with respect to the Intel processors that you personally have worked on about the relationship between power and performance in those chips. Do you have that subject in mind?
11:37 A. I do.
11:37 Q. Is there a direct correlation in those chips between a 1 percent increase in power consumption and a 1 percent

increase in performance?

A. No. There's no real direct relationship. In fact, it depends on so many factors, like whether you're operating in a battery life mode or whether you're operating at high performance or somewhere in between. So there's really no set relationship at all.

Q. Last few questions, Mr. Douglas.

In this case VLSI has accused Intel of infringing two patents. You understand that, right?

A. Yes.

Q. Not going to ask you about the contents of those patents. I just want to ask you a couple of very simple questions.

Had you heard of the '373 patent before this case?

A. No. I had not.

Q. When you and your colleagues were working on the chip designs that you've described to the jury, at any point in time in that period had you heard of the '373 patent?

A. No. None of us had.

Q. When was the first time you heard of the '373 patent?

A. It was in conjunction with this litigation.

Q. Now, there's another patent in the case, the '759, and I'm going to represent to you that what's being accused there is some other architectures that other engineers will speak to, but have you heard of the '759 patent before this

11:39 1 case?
11:39 2 A. No. I had not.
11:39 3 Q. Thank you, sir. I have no further questions.
11:39 4 A. Thank you.
11:39 5 THE COURT: Counsel?
11:39 6 MR. HATTENBACH: Thank you, Your Honor.
11:39 7 CROSS-EXAMINATION
11:39 8 BY MR. HATTENBACH:
11:40 9 Q. Good morning, Mr. Douglas.
11:40 10 A. Good morning.
11:40 11 Q. I feel like this is going to go well because we're
11:40 12 wearing the same outfit today, so... Roughly the same outfit.
11:40 13 A. Yes.
11:40 14 Q. Now, in your direct testimony the only document you
11:40 15 discussed was a document from Intel describing the technology
11:40 16 at issue. And it's a document that's marked "Intel Top
11:40 17 Secret," correct?
11:40 18 A. Yes.
11:40 19 Q. And NXP would never have had access to that document,
11:40 20 correct?
11:40 21 A. It would be unlikely.
11:40 22 Q. And VLSI would never have had access to that Intel
11:40 23 top secret document, correct?
11:40 24 A. It would be unlikely.
11:40 25 Q. And you're aware that Intel was required to provide

that document to VLSI's outside lawyers and experts in this litigation because a lawsuit was pending, correct?

A. Yes.

Q. And in fact, VLSI is not even entitled to be here today to see the contents of that document under the Court's protective order, correct?

A. That's my understanding.

Q. All right. Now, you spent a while discussing various pieces of technology from many years ago at Intel, such as the Penryn and the Nehalem and there were a variety of others. Do you recall that generally?

A. I do.

Q. You realize that in this case Intel is not challenging the validity of VLSI's '373 patent, correct?

A. I understand that. Yes.

Q. And so to be clear, Intel is not claiming that it made any of the inventions in that '373 patent before Mr. Bearden and his team of engineers at Freescale did, correct?

A. My understanding is that's not quite correct.

Q. So Intel is making that claim and its expert just didn't happen to put it in his report or what?

A. I'm saying Intel is not challenging the validity of the patent.

Q. Okay. Is Intel claiming in this case that it made

11:42 the inventions of the '373 patent before VLSI or before
11:42 Mr. Bearden and the people at Freescale?
11:42 A. No.
11:42 Q. Thank you.
11:42 Now, you're familiar with a component in the Intel Haswell
11:42 and Broadwell processors known as FIVR, right?
11:42 A. Yes.
11:42 Q. It's the F-I-V-R block that we were looking at a few
11:42 minutes ago?
11:42 A. Yes.
11:42 Q. And that FIVR stands for fully integrated voltage
11:42 regulator, right?
11:42 A. That's correct.
11:42 Q. And you agree that FIVR is a voltage regulator,
11:42 right?
11:42 A. Yes.
11:42 Q. And using regulated voltage ensures that a circuit
11:42 performs predictably and reliably, right?
11:43 A. Yes.
11:43 Q. And you played a role in the creation of FIVR, right?
11:43 A. Yes. I did.
11:43 Q. And by the way, the Penryn and Nehalem processors you
11:43 were discussing, those did not have FIVR, correct?
11:43 A. No. They had external regulators.
11:43 Q. Thank you.

11:43 You're also familiar with a component in Intel's accused products called the PCU. I think we saw that on your block diagram as well, right?

A. Yes.

Q. And PCU stands for power control unit, right?

A. That's correct.

Q. And the PCU is present in both the Haswell and the Broadwell, right?

A. Yes.

Q. And the PCU is a part of a chip that controls some of the power management functions, correct?

A. Yes.

Q. And in particular, the PCU has the ability to control the operation of the FIVR domain, right?

A. Yes. In some aspects.

Q. And so, for example, the PCU is responsible for telling the FIVR when the PCU wants the voltage to ramp down to zero, correct?

A. That's correct.

Q. All right. Let's talk about that voltage ramping upwards and downwards. After the PCU tells the voltage regulator to ramp down to zero, the process of the FIVR ramping its voltage down to zero takes some time, right?

A. Yes. It does.

Q. It's not instantaneous, right?

11:44 A. No. It cannot be.
11:44 Q. And now, the rate at which the FIVR ramps down the voltage is actually programmable, correct?
11:44 A. Yes. By Intel.
11:44 Q. Right. And that rate, that programmed rate, it's programmed not by anyone, but it's programmed by Intel in the accused products, right?
11:44 A. That's correct.
11:44 Q. And so in other words, Intel determines how quickly or how slowly the voltage ramps up and down, right? That's what you mean by programmable?
11:44 A. Yes. It determines that voltage.
11:44 Q. And on the Haswell processor, Intel set that ramp down rate to be 2 volts per microsecond, right?
11:45 A. Yes. Approximately.
11:45 Q. So it takes about 500 nanoseconds to ramp down from 1 volt to approximately zero volts in the accused products, right?
11:45 A. Yes. That's that half microsecond.
11:45 Q. And then at the conclusion of what I think you called the Package C7 sleep state, the FIVR will ramp that voltage back up, correct?
11:45 A. That's correct.
11:45 Q. And that voltage ramp-up process also takes some time, right?

11:45 A. Yes. It does.
11:45 Q. In fact, the voltage ramping out of the Package C7 state in the accused processors takes about 2,000 nanoseconds, right?
11:45 A. The process of ramping the voltage up takes the same amount of time as ramping it down.
11:45 Q. So 500 nanoseconds?
11:45 A. Yes.
11:45 Q. All right. And the voltage that we're talking about as being ramped up, it's called VCCR. It's that ring voltage that you referred to earlier, correct?
11:46 A. We were talking generic, but yes. It happens to the ring.
11:46 Q. Okay. And for that 500-nanosecond period after exiting the Package C7 state, the VCCR voltage is nonzero and ramping up, correct?
11:46 A. That is correct.
11:46 Q. So in summary, when the processor exits the Package C7 state, the VCCR voltage begins to ramp up and then continues to ramp up over a period of time, right?
11:46 A. Yes.
11:46 Q. And similarly when the processor enters the Package C7 state, the VCCR voltage begins to ramp down and ramps down for a period of time as well, correct?
11:46 A. That's correct.

11:46 Q. Thank you.
11:46 Now, let's turn to a different subject.
11:46 Typically, if you're adding a complex circuit to a processor at Intel, you're going to have a good reason for doing that, right?
11:46 A. Generally. Yes.
11:47 Q. You wouldn't just add a complicated circuit to an Intel processor for no reason, right?
11:47 A. That's generally the case. Yes.
11:47 Q. Okay. The voltage ramping we just discussed is controlled by a circuit called the "ramp controller," right?
11:47 A. That is correct.
11:47 Q. And Haswell and the Broadwell, they both have that ramp controller inside of them, right?
11:47 A. Yes. They do.
11:47 Q. And the ramp controller is a pretty complicated circuit, isn't it, sir?
11:47 A. Not for that function. It's a pretty straightforward sequencer.
11:47 Q. Okay.
11:47 MR. HATTENBACH: Let's take a look, Mr. Simmons, if you could bring up PTX-4454 at Page 33. I think we're about to have another video problem here.
11:47 THE WITNESS: Do I open my binder?
11:47 BY MR. HATTENBACH:

11:47 Q. Yes. It's in your binder. It's -- I think it's the last document, and we're looking at Page 33.

11:47 A. So 4454?

11:48 Q. I believe that's right. You got it. There you are.

11:48 And so this figure at the top of the page here, this is the one that you're saying is a pretty straightforward circuit?

11:48 A. Okay.

11:48 Q. The one with --

11:48 A. Give me a second to look at that.

11:48 Q. Sure.

11:48 MR. MUELLER: Your Honor, we ask that the public screens be turned off for this.

11:48 THE COURT: Okay.

11:48 BY THE WITNESS:

11:48 A. Okay. I've looked at it.

11:48 BY MR. HATTENBACH:

11:48 Q. And so your testimony, I believe, was -- I might be misremembering. I think you said something about it's a pretty straightforward circuit, something to that effect?

11:48 A. I said the ramp portion is a pretty straightforward circuit.

11:48 Q. The rail portion? What's the rail portion?

11:48 A. The ramp portion.

11:48 Q. Ramp?

11:48 A. Yes.

11:48 Q. Thank you.
11:48 And so how many boxes do we see here?
11:49 A. I see one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve --
11:49 Q. It's got to be a couple dozen boxes in here, right? And those are each functional blocks of this circuit that you call straightforward?
11:49 A. Yes. Many of them are not involved in the ramp operation.
11:49 Q. Okay. The circuit is simply -- the circuit is surely complicated enough that your counsel wants to prevent the public from finding out about it, right?
11:49 MR. MUELLER: Your Honor, I object.
11:49 THE COURT: Sustained.
11:49 BY MR. HATTENBACH:
11:49 Q. You understand this is confidential to Intel how this ramp controller is designed?
11:49 A. Yeah. The entire document is confidential.
11:49 Q. But I'm asking about the ramp controller. This ramp controller design is confidential to Intel, and Intel would not want members of the public knowing about it, right?
11:49 A. Yes. That and the whole document.
11:49 Q. And you know this ramp controller is squarely at issue in this case, right?
11:50 A. I was not aware of that.

11:50 Q. Did you hear Professor Conte testifying a couple of days ago?

MR. MUELLER: Your Honor, I object. He's been sequestered from hearing anyone.

THE COURT: Correct.

MR. HATTENBACH: Okay. That's fine. He can just answer now.

BY THE WITNESS:

A. No.

BY MR. HATTENBACH:

Q. Now, this ramp controller was not shown on your magnet board that you presented to the jury, right?

A. That's correct.

Q. Okay. And Intel includes this ramp controller in its products for a reason, right?

A. Yes, that's correct.

Q. The ramp controller makes sure that the FIVR in the accused products ramps the voltage up and down in a very carefully controlled way, right?

A. Yes. It ramps it at a fixed rate up and down.

Q. And that fixed rate is very carefully controlled, right?

A. Yes. It's a fixed rate.

Q. And it's very carefully controlled by Intel, right?

A. It is set by Intel at a fixed rate.

11:50 Q. And are you disagreeing or agreeing that's it's very carefully controlled by Intel? I just want to be clear about that.

11:50 A. It's math. So I would not say careful. It's just a number.

11:51 Q. Okay. Intel chose that number, right?

11:51 A. Yes.

11:51 Q. Did Intel choose that number intentionally or arbitrarily?

11:51 A. It was reasonably intentional.

11:51 Q. Okay. So to be more specific, Intel's ramp controller circuitry makes sure that the voltage is ramped up and down at rates especially chosen by Intel, correct?

11:51 A. Yes. At rates chosen by Intel.

11:51 Q. And both the starting voltage and ending voltage are also specially chosen by Intel, right?

11:51 A. Yes. Those are.

11:51 Q. Okay. I just have a few more questions.

11:51 You're aware of no policy that Intel has that discourages employees from reading patents, correct?

11:51 A. I'm aware of no policy.

11:51 Q. All right. The rate we were talking about of ramping up and down out of the FIVR, that does not vary, correct? It's a fixed rate?

11:52 A. Yes. It was a fixed rate for all processors shipped.

11:52 Q. It's a constant rate?
11:52 A. Yes.
11:52 Q. All right. And that property of FIVR has not changed in the processors from Intel that contain FIVR, right?
11:52 A. I believe in here for the VCCR specifically, that's set the same between Haswell and Broadwell.
11:52 Q. And in those Haswell and Broadwell products, there is a voltage where if it goes below some point, one or more of the components within the C6 SRAM could not function properly, right?
11:52 A. Yeah. There's a theoretical voltage.
11:52 Q. Well, but in real life there's a voltage below which in the Broadwell and Haswell products, the C6 SRAM will not function properly, right?
11:52 A. Yes. I don't know what that is.
11:53 Q. All right. And there's another voltage you talked about called VCCIO. Do you recall that?
11:53 A. Yes.
11:53 Q. All right. And that voltage typically tends to be around 1 volt, right?
11:53 A. Roughly, plus or minus some amount.
11:53 Q. All right. On the '373 accused products, again Haswell and Broadwell, there's a FIVR that is supplying voltage to the CLR domain, right?
11:53 A. Yes.

11:53 Q. I think we saw that on your board, right?
11:53 A. Yep.
11:53 Q. And that's the VCCR voltage, correct?
11:53 A. Yeah. It supplies that to the whole ring domain.
11:53 Q. Okay. And there's also in the Haswell and Broadwell accused products a VCCIO voltage that's being provided by a FIVR domain, correct?
11:53 A. Yes. And may I ask you to just come a little closer to the mic here? You're tailing off a little.
11:53 Q. Apologies.
11:53 A. Thanks.
11:53 Q. Different question, different topic.
11:54 Do you understand that the amount of a reasonable royalty for use of a patent can be based on the value that use provides to the company using the patent?
11:54 A. I'm not that familiar with royalties and patent cases.
11:54 Q. So you don't have that understanding?
11:54 A. I believe that's roughly the case.
11:54 Q. All right. Thank you, sir.
11:54 MR. HATTENBACH: That's all I have.
11:54 THE COURT: Mr. Mueller?
11:54 MR. MUELLER: Thank you, Your Honor.
11:54 REDIRECT EXAMINATION
11:54 BY MR. MUELLER:

11:54 Q. Just a few final questions, Mr. Douglas.
11:54 You were shown a document and reference was made to the
11:55 number of components on the page. Do you recall that?
11:55 A. Yes, I do.
11:55 Q. And a suggestion that the number of components showed
11:55 it was complicated. Do you recall that?
11:55 A. I do.
11:55 Q. How many components are in a computer chip like
11:55 Haswell?
11:55 A. At the level of the drawing I was shown, that would
11:55 be tens of thousands.
11:55 Q. Now, you were asked some questions about the
11:55 ramp-down process for the VCCR. Do you recall those, sir?
11:55 A. I do.
11:55 Q. And let's just make sure we're on the same page.
11:55 MR. MUELLER: I'm going to put DDX-5.5 one more time.
11:55 BY MR. MUELLER:
11:55 Q. Let's just set the stage here.
11:56 I want you to have in mind a situation where, first, the
11:56 voltage is being supplied by the VCCR. Do you have that in
11:56 mind?
11:56 A. I do.
11:56 Q. And then the PCU makes the decision to go into
11:56 Package C7 sleep state. Do you have that in mind?
11:56 A. I do.

11:56 Q. What happens in that circumstance?
11:56 A. So in that circumstance it will turn the clocks off, which we don't show here, and then it will switch that supply mux over to VCCIO.
11:56 Q. And power is then supplied by VCCIO?
11:56 A. To the C6 SRAM, yes.
11:56 Q. Now, while that's happening, what is the ramp-down process for the VCCR?
11:56 A. Sure. So the PCU will give VCCR a target voltage of zero. It will tell it to ramp to zero. So it will do that, and then it will essentially float the voltage like we had talked about earlier.
11:56 Q. In this ramp-down process, is it using a ramp-down because if it just plummeted to zero, it would end up frying the circuits or decreasing the useful life? Is that true?
11:57 A. No. Not at all. No voltage regulator can plummet down to zero.
11:57 Q. What happens to the other circuits in the ring domain during the ramp?
11:57 A. They are shut off, and they're not active at all.
11:57 Q. And is the VCCR supplying a reliable voltage during that ramp-down period?
11:57 A. No, it is not.
11:57 Q. Just a few final questions, Mr. Douglas.
11:57 You were asked a few times about the accused '373

products. Do you recall that?

A. I do.

Q. Now, those are just what's accused, right?

A. Yes.

Q. If we look at any of these Intel documents for the architecture you've been describing, are we going to see a reference to the '373 patent in those documents?

A. No. Never.

Q. Now, you were asked some questions about a policy about reading patents from other companies. Do you recall that?

A. I do.

Q. You've been at Intel 28 years, right, sir?

A. That's correct.

Q. Over the years have you made it a personal practice to read other companies' patents?

A. No, I have not.

Q. Why not?

A. Because I'm focused on innovating and doing my own design work.

Q. Where did the ideas in the architecture that you've explained to the jury come from?

A. They came from me and my colleagues at Intel.

Q. And you're proud of your work?

A. Extremely.

11:58 Q. Thank you, sir.
MR. MUELLER: I have no further questions.
THE WITNESS: You're welcome.
MR. HATTENBACH: Nothing further.
Thank you, Mr. Douglas.
THE WITNESS: Thank you.
THE COURT: You may step down. Thank you, sir.
And may he be released?
MR. LEE: Your Honor, we would next play a deposition.
THE COURT: May this witness be released?
MR. LEE: Yes.
THE COURT: And, Mr. Hattenbach, may this witness be released?
MR. HATTENBACH: Yes.
THE COURT: You're free to go, sir. And that means you're free to really go.
(Laughter.)
THE COURT: Mr. Lee?
MR. LEE: I think he actually wants to stay.
THE COURT: And let me -- if I wasn't clear, you're welcome to stay as well. So I'm not telling you you have to leave. I'm just saying you may.
THE WITNESS: Okay. Thank you.
MR. LEE: Your Honor, we'll do whatever's best for the jury and for you. We have an eight-minute deposition clip. We

could do that before the lunch hour --

THE COURT: Let's do it now and get it done and then we'll go.

MR. LEE: Ladies and gentlemen --

THE COURT: Let me take a vote. Is that okay?

Okay. Yeah. Let's do that.

MR. LEE: We're going to show an eight-minute deposition clip from one of the inventors of the '373 patent, Shayan Zhang, who you heard about. The running time is eight minutes and 22 seconds. Six minutes and 32 seconds are allocated to Intel. One minute and 51 seconds are allocated to VLSI, so you have both parties' designations, Your Honor.

THE COURT: But we're going to round up on both of those.

MR. SLUSARCZYK: Your Honor, we have objections that are unresolved to Mr. Zhang's testimony.

THE COURT: Do you have a transcript of it?

MR. LEE: Sure.

THE COURT: If you'll hand it to me, I'll resolve them in less time than it'll take to play it, I promise you.

Is there a specific question you have an objection to?

MR. SLUSARCZYK: To the entire thing, Your Honor.

THE COURT: The entire thing?

MR. SLUSARCZYK: Yes.

THE COURT: That'll be overruled.

Mr. Lee, you may play it.

MR. LEE: Thank you, Your Honor.

DIRECT EXAMINATION

BY MR. COX:

Q. Could you please state your full name for the record?

A. Shayan Zhang.

Q. And do you understand your testimony here today is given under oath?

A. Understand. Yes.

Q. Is there any reason that you cannot provide complete and accurate testimony here today?

A. I don't think I have any reason.

Q. VLSI is paying you $360 per hour in connection with this deposition?

A. For this one.

Q. How did you prepare for your deposition today?

A. I met with my attorney on Saturday and Thursday. We discussed for about five, six hours. Yes. That's what we -- yes.

Q. When you're referring to your attorney, are you referring to Mr. Slusarczyk?

A. Yes. Dominik. Yeah.

Q. And have you heard of VLSI?

A. I don't know much about VLSI except the name.

Q. This lawsuit began on April 11th, 2019. Did anyone from VLSI talk to you before the lawsuit started?

12:02 A. No.
12:02 Q. Okay. I'll represent to you that U.S. Patent No. 7,523,373 is a patent that VLSI alleges that Intel infringes.
12:03 You are a named inventor on U.S. Patent No. 7,523,373; is that correct?
12:03 A. Yes.
12:03 Q. Before this lawsuit was filed, did VLSI ever ask your views on whether Intel infringes U.S. Patent No. 7,523,373?
12:03 A. No.
12:03 Q. In your own words, can you tell me what the invention of the '373 patent is?
12:03 A. I did not write this document. I don't remember it.
12:03 Q. The title of the '373 patent is "Minimum Memory Operating Voltage Technique"; is that right?
12:03 A. It is shown on this paper. Yes.
12:03 Q. What do the words "minimum memory operating voltage technique" mean to you?
12:04 A. I did not write this document. I don't remember the details. In general, it can mean different things. But I -- I don't remember.
12:04 Q. Dr. Zhang, do you see the abstract on the screen in front of you?
12:04 A. Yes. I see it.
12:04 Q. Is that an accurate description of the claimed invention of the '373 patent?

12:04 A. I did not write it. I don't remember it. And I'm not in a position to interpret the invention.
12:04 Q. Can you tell me what problems you were trying to solve when you invented the ideas in the '373 patent?
12:04 A. It has been a long time ago. I don't remember it.
12:05 Q. Are there reasons that a circuit would be improved by implementing the invention of the '373 patent?
12:05 A. It has been a long time. I don't remember it.
12:05 Q. Can you tell me anything about how the '373 patent was different than what came before the '373 patent?
12:05 A. I don't know. I'm not in a position to interpret that.
12:05 Q. Did you ever build a product that implemented the invention of the '373 patent?
12:05 A. I don't remember it.
12:05 Q. Did your co-inventors ever build a product like the system described in the '373 patent?
12:05 A. No. I don't remember it.
12:06 Q. You can't tell us what the invention of the '373 patent is, correct?
12:06 A. I did not write a document, and I'm not in the position to interpret the invention.
12:06 Q. Are you aware of any articles, books or papers that mention the '373 patent?
12:06 A. No. I don't remember it.

Q. To your knowledge, has the '373 patent ever been discussed at any academic or industry conferences?
A. I don't remember it.
Q. Did Freescale ever implement the '373 patent in any products?
A. No. I don't know, and I don't remember.
Q. Did NXP ever implement the '373 patent in any products?
A. No. I don't know. I don't remember it.
Q. Has VLSI ever implemented the '373 patent in any products?
A. No. I don't know.
Q. Are you aware of any product at all that used the invention described in the '373 patent?
A. No. I don't know.
Q. To your knowledge, has anyone ever taken a license to the '373 patent?
A. No. I don't know.
Q. In your view, has the '373 patent changed the microprocessor industry in any way?
A. No. I don't know.

CROSS-EXAMINATION

BY MR. SLUSARCZYK:

Q. Are you currently employed full time by TSMC?
A. I'm currently full employed by TSMC. Yes.

12:08 Q. About how many hours do you work in a typical week as a full-time employee at TSMC?
12:08 A. Averagely, around 40, 50 hours a week.
12:08 Q. Did you work a full week last week?
12:08 A. Yes. I worked full week last week.
12:08 Q. And did you work a full week the week before last week?
12:08 A. Yes. I worked a full week before last week.
12:08 Q. Do you anticipate working a full week this coming week at your job as a full-time employee at TSMC?
12:08 A. Yes. I anticipate I will work the whole week next week.
12:08 Q. And today is a Saturday, correct?
12:08 A. Yes. Today is a Saturday.
12:08 Q. And you took several hours out of your day last Saturday as well to prepare for this deposition; is that correct?
12:09 A. Yes. I did.
12:09 Q. You also took time out of your week on Thursday evening this past week to further prepare for this deposition; is that correct?
12:09 A. Yes. I did.
12:09 Q. If you were not here to testify this Saturday, today, at this deposition, what would you be doing?
12:09 A. For sure I will spend the time with my family.

REDIRECT EXAMINATION

BY MR. COX:

Q. And you are in fact being paid $360 an hour for the time you spent preparing for this deposition?

A. I think I will be paid for my time. Yes.

MR. LEE: Your Honor, that completes the deposition clip.

THE COURT: Thank you. Got it.

Ladies and gentlemen of the jury, it's a little after 12:00. Why don't -- if you will come back and be in your -- wherever it is that they have you -- it used to be as you come through this hallway, there's a jury room in here, which is very tiny. And so I used to know where you all were at all times and it was much easier for us, but for obvious reasons we have you sitting in places a little larger and you can spread out a little bit more.

So wherever it is they take you during these periods of time, if you'll be back by about 1:20, we'll get started at 1:30. Remembering my instructions not to discuss the case amongst yourselves.

THE BAILIFF: All rise.

(Jury exited the courtroom at 12:10.)

THE COURT: You may be seated.

Mr. Chu, is there anything we need to take up at this time?

MR. CHU: No, Your Honor.

12:11 THE COURT: Mr. Lee?

12:11 MR. LEE: Your Honor, I just have to state for the record the JMOL, but we can do that when we come back.

12:11 THE COURT: Why don't -- how long is it going to take?

12:11 MR. LEE: Five minutes.

12:11 THE COURT: Go ahead, please.

12:11 MR. LEE: Okay.

12:11 THE COURT: And thank you for -- I'd forgotten it, so I'm glad you remembered.

12:11 MR. LEE: So Your Honor --

12:11 THE COURT: And let me interrupt one more time. I want to put on the record, again, that the reason for the timing of you doing it now rather than at the time when Mr. Chu closed was an accommodation to the Court and that Mr. Chu agreed on behalf of VLSI, that this, what you're about to say right now, would have been -- the argument would have been made at the end of VLSI's case to protect your record.

12:12 MR. LEE: And what I'll do, Your Honor, as I mentioned to you and Mr. Chu, is I will do it at a very high level, a table of contents level, and we will file a written motion so the record is complete and I don't burn our lunchtime unnecessarily.

12:12 So, Your Honor, we would move under Rule 50A for JMOL as to all issues on which VLSI carries the burden of proof, infringement, willfulness and damages, that would include

12:12 direct infringement of the '373 patent. It would include
12:12 literal infringement, because they have failed to meet their
12:12 burden of demonstrating infringement of the asserted claims.
12:12 The written submission will identify the specific limitations
12:12 and absence of proof.
12:12 We would also move for JMOL on the Doctrine of Equivalents
12:12 for a similar reason, the failure to meet the burden of proof
12:12 and to offer the type of linking arguments that are required.
12:13 We would move and we'll move specifically for its failure
12:13 to carry its burdens on dropped claims for the Haswell and
12:13 Broadwell products, and we'll identify them.
12:13 We will -- we are moving for JMOL on literal infringement
12:13 of the '759 patent for the Lake products that include Intel's
12:13 Speed Shift technology or any other processors the essentially
12:13 the same structures.
12:13 In the written submission, Your Honor, we'll identify the
12:13 specific limitations -- I think Your Honor knows them from the
12:13 evidence -- that we contend are -- have not been satisfied.
12:13 On the Doctrine of Equivalents, we would move for JMOL as
12:13 well. But let me just say that in addition to the failure to
12:13 satisfy the burden of proof for the Doctrine of Equivalents
12:13 test, one of the issues Your Honor allowed to go to the jury
12:14 was the question of prosecution history estoppel. And given
12:14 the amendments made to the claims, we would contend that as a
12:14 matter of law they are precluded. And again, we'll amplify

that in the written submission.

And similarly for the dropped claims, VLSI failed to meet its burden of proof, that the Lake products infringe.

On indirect infringement, Your Honor, there was no evidence to support the direct infringement, so there can't be any indirect infringement and they haven't offered any evidence to support independently an indirect infringement claim.

On willfulness, Your Honor allowed both post -- pre-suit willfulness and post-suit willfulness to go to the jury. Now that they've rested, and this is one of the reasons I wanted to be sure that they rested before we made these motions, there's no evidence to support a pre-suit willfulness claim nor a post-suit willfulness claim.

And again, we'll amplify, but I think given the arguments we've made to Your Honor previously, given the evidence that came in before they rested, there's nothing to support as a legal matter or a factual matter those claims.

And, finally, we will move -- we move JMOL for the failure to meet their burden on the damages claims, the failure to offer a reliable and tested methodology that can be implemented in this context. We will -- we have briefed some of that to Your Honor before. We will amplify it in the written submission.

We'd move for JMOL on all of those issues.

Thank you, Your Honor.

12:15 THE COURT: They'll be overruled. And so we will -- without prejudice to you raising them again at the end of trial.

MR. LEE: I understand. Yeah.

THE COURT: So --

MR. LEE: Just have to do it now.

THE COURT: No. I understand. I had a case where the defendant failed to do what you just did and the plaintiff won a verdict. And had they preserved their record, I would have taken the verdict away at the end, but I couldn't because they didn't think to do that. So I get it.

Is there anything else we need to take up now?

MR. LEE: Nothing, Your Honor, for us.

THE COURT: Mr. Chu?

MR. CHU: There is. And it's up to you, Your Honor. I mentioned early this morning they have Dr. Rotem who is going to testify and we have an issue to call to Your Honor's attention.

THE COURT: What is that?

Yes, sir.

MR. REDJAIAN: Good afternoon. Babak Redjaian representing VLSI.

THE COURT: Good to see you.

MR. REDJAIAN: Good to see you.

We have an issue with one of the slides that they produced

last night with respect to Dr. Rotem. And if I can put that and show you.

THE COURT: Sure. It's easier to use just the -- there we go. Or you could just hand it to me.

MR. REDJAIAN: Maybe that's easier.

THE COURT: Okay. And for the record, this is Slide --

MR. REDJAIAN: PTX-8.4.

THE COURT: And this will be offered by Intel?

MR. REDJAIAN: Yes.

THE COURT: Okay. Go ahead.

MR. REDJAIAN: And, Your Honor, it looks like expert opinion. It has prior art mention on it. Mr. Rotem is a fact witness. And there's a hearsay document, the thesis that's put on the timeline. And it just looks like expert-type slides you see as a legal conclusion with respect to what's prior art. And so we --

THE COURT: And he's an Intel witness?

MR. REDJAIAN: Yes, Your Honor.

THE COURT: I mean, an Intel corporate witness, not a --

MR. MUELLER: We might be able to make this a little bit easier. We can take prior art off the slide. The remaining facts are all personal knowledge facts.

THE COURT: I agree. And it's just a demonstrative, so I'm okay with the rest of it. But to the extent, again, for example, if this gentleman is an Intel corporate person or an

engineer at Intel, he's not going to be discussing prior art or validity or those type of issues.

MR. MUELLER: Absolutely not.

THE COURT: I mean, certainly he can say if he knew about these patents or not. I don't perceive that. But again, VLSI if they believe that -- are you going to be handling this witness on cross?

MR. REDJAIAN: Yes, Your Honor.

THE COURT: If you believe that this witness veers into expert world as opposed to an engineer at Intel world, you object and we'll go question by question, and I'll deal with it, because I certainly understand what the issue is.

MR. REDJAIAN: Okay. Thank you, Your Honor.

MR. MUELLER: Thank you, Your Honor.

THE COURT: Oh. And one final thing which is not for you two, I've got -- and I started going through the deposition of Mr. Stolarski -- is with regard to the Fortress issue. Are the only areas you care for me to rule on where you had put in red where it says "Fortress MIL prejudicial"? Or is it everywhere where Fortress is mentioned?

There's a lot of stuff, I'll tell you, Mr. Chu, here about Fortress that is very innocuous that I don't have a problem with coming in. I do -- there may be other -- there may be parts of this I have an issue with, but, you know, the jury's going to hear -- I'm looking at Page 73, it says "who are these

12:20 three people," and then the three people are named. "And were
12:20 at that time they contacted me working for Fortress Investment
12:20 Group to my knowledge." It seems to me that that's just a
12:20 fact. I don't see how that could be prejudicial.
12:20 There are -- but that's not my question at the moment. My
12:20 question at the moment is: Does VLSI object to everywhere
12:20 Fortress is mentioned? That's the question.
12:20 MR. HEINRICH: So I believe our objections -- we had
12:20 narrow objections, but I believe that they included every
12:20 instance where Fortress was mentioned.
12:21 THE COURT: That's fine. I will rule, then, on every
12:21 instance where Fortress is mentioned.
12:21 MR. HEINRICH: Okay.
12:21 THE COURT: And take that up.
12:21 Yes, sir?
12:21 MR. CHU: So there is another upcoming witness, a
12:21 Dr. Sylvester. We'll get to him today and --
12:21 THE COURT: Okay. Is he an expert or --
12:21 MR. CHU: Yes, he is.
12:21 THE COURT: Okay.
12:21 MR. CHU: And we submitted but would expect the Court
12:21 didn't have an opportunity to see our submission yet. There is
12:21 this slide that I have put on the ELMO.
12:21 THE COURT: Why don't you just hand it to me. Or if it's
12:21 up, that's fine. Go ahead. I can see it.

12:21 MR. CHU: Okay. Now Intel dropped its validity case against the '373 patent. And what they're doing is highly prejudicial, because they're trying to suggest to the jury that the '373 patent is invalid. As you can see from the slide they have, it depicts Intel patents predating the '373 patent, creating a high risk of juror confusion and unfair prejudice to VLSI.

This slide and related argument and testimony are also barred by the Court's ruling on MIL 4.3. So you can see on the slide they are pointing out specific parts that relate to claims. Intel tries to make the argument, well, this is just state of the art, but they're pointing out specifics of issues that we are discussing with respect to infringement and the claim itself.

The only reason to do this is to suggest that the patents are invalid.

This ends up being, not only from the slide, but from Dr. Sylvester's expert report, an invalidity analysis or is strongly suggested --

THE COURT: Let me ask you this: Did he give an invalidity opinion and then you all, Intel, decided not to maintain an invalidity defense?

MR. LEE: He did two things, Your Honor. And Your Honor may recall that after you ruled on that MIL, at the second -- the next hearing I asked for clarification. Because I said

that there would be information that would still be relevant to damages and the value of the patent. And one of the questions is the value of the patent over what had existed before.

He also opined on that because he was responding on damages issues. So we're not putting this in to demonstrate invalidity in any way. We're saying this is the state of the art. And then the question is: What's the value over the state of the art?

And that happens to include -- and we try to be very precise because we know Your Honor didn't want us just randomly picking Intel patents, the Intel patents that would be part of it. But this is -- he has given technical -- his expert report --

THE COURT: Here's what I'm going to do. If when you are -- Mr. Chu, here's what I'm going to do in response to your objection.

When this issue comes up and the slide comes up, if Intel makes it clear to the jury that this is not about invalidity --

MR. LEE: I'll do that.

THE COURT: -- it has nothing to do with invalidity, because you are not raising an invalidity defense, then I will allow this testimony to come in.

MR. CHU: Your Honor, there is a separate issue --

THE COURT: Okay.

MR. CHU: -- that was discussed with Your Honor. And I

thought the Court's ruling was very clear. According from what I believe is the transcript, this was in connection with the MILs. Statements that certain patents exist is allowed, but no need to mention they're Intel patents. Intel must notify the Court if they plan to discuss one of their patents.

By the way, that notice didn't occur. We're providing the notice because they were complying with the disclosure rules to opposing counsel.

Continuing on, "Intel is not going to connect, intimate or say explicitly that the fact that they have patents has any impact with respect to the value of the patents."

Now, Mr. Lee just said two things. He said, well, this is state of the art. If that's so, no need to say anything about Intel patents or to call out particular limitations.

And then he just said, oh, well, we have this damages theory to make this relevant. And that was directly ruled upon by the Court.

MR. LEE: And that's why I came back at the next hearing to ask Your Honor for a clarification so that we could be sure that -- and I will make it very clear that we're not pursuing an invalidity attack, that we're putting this in for the value of the invention. And we'll put it in precisely that way.

MR. CHU: There was no clarification to change the Court's ruling. We tried our case and rested relying on that, and now for them to pop up based on the disclosure of the slides when

12:26 the Court was very clear that they needed to bring it to the
12:26 attention of the Court in advance. "Intel must notify the
12:26 Court if they plan to discuss one of the patents." That did
12:26 not occur.
12:26 THE COURT: When will this expert go on?
12:26 MR. CHU: I think this afternoon.
12:26 MR. LEE: And, Your Honor, yes, he's going to go right
12:26 after lunch. And one of the things we had intended to raise
12:26 this morning is when the patents might arrive with the
12:26 different witnesses, but there's a discrete number. These are
12:26 the only two that he's going to be talking about.
12:26 THE COURT: Okay. Well, I'll think about this over lunch
12:26 and I'll give you a ruling after lunch. But it will be before
12:26 that witness goes on.
12:26 MR. LEE: That's fine.
12:26 MR. CHU: Thank you, Your Honor.
12:26 THE COURT: Anything else?
12:26 MR. LEE: Nothing for Intel, Your Honor.
12:26 MR. CHU: Not for us, Your Honor. Have a nice lunch.
12:27 THE BAILIFF: All rise.
12:27 (Recess taken from 12:27 to 1:40.)
01:40 THE BAILIFF: All rise.
01:40 THE COURT: Thank you. You may be seated.
01:40 I thought about the issue we took up right before lunch
01:40 over the lunch break. I'm going to exclude the demonstrative

that Mr. Lee wanted to present.

With regard to questioning in that area, I would be very cautious, if I were Intel, about mentioning Intel patents, but I'm going to allow Mr. -- or whoever it is, Mr. Lee or whoever it is on behalf of Intel to ask the questions.

If VLSI objects to the questions, we'll do it the old fashioned way, which is you stand up and you say, Your Honor, I object, and I will rule on it -- I'll rule on the specific questions, but I'm going to exclude that specific demonstrative.

I heard there was one issue we needed to take up?

MR. CHU: I think earlier today I was not in the courtroom. It was during the break and Your Honor came in and said something to the effect you'd like to finish up by Friday afternoon, and I had a question.

THE COURT: Oh, no, no, no. I'm sorry. If I said I'd like to finish by -- that's, I'd like to finish by Friday afternoon.

MR. CHU: Oh.

THE COURT: I'm doing my best. I'm going to do everything I can to get finished by Friday, but I'm not -- I was only trying to tell the folks I'm going to go, if we need to, a little long today, to 5:30 or 6:00 just so if we can finish tomorrow, we will. But I'm not -- if we go over to Monday, we go over to Monday.

01:41 If that was -- that was my fault for -- maybe for saying it the way I did. Y'all have time limits -- I'm sorry. Y'all have time limits, and I'm not revoking those. Y'all have been great. I doubt you all will use your time limits, in fact, and so there's no goal to get this done by Friday.

01:41 Tomorrow after we finish with the trial, we will take up the jury charge so that we can on Monday when you finish take -- we really do need to get this to the jury on Monday. That is for sure. But I have no goal to land the jet by 5:00 p.m. tomorrow.

01:42 MR. CHU: I just wanted to remind the Court, we do have a rebuttal case because they have an invalidity position --

01:42 THE COURT: Understood.

01:42 MR. CHU: -- and we haven't addressed that. We expect Professor Conte will be addressing that.

01:42 They also have a damages case that's based in part on license agreements, and we have Mark Chandler who's an expert in that area who'll be responding. So we at least have those two rebuttal witnesses.

01:42 THE COURT: I'm -- you all have the time that you have.

01:42 MR. CHU: Thank you.

01:42 THE COURT: I mean, I in no way meant to imply I was planning on getting this done. I would like to finish by tomorrow if we can.

01:42 MR. CHU: Okay. Thank you very much, Your Honor.

01:42 THE COURT: Mr. Lee?
01:42 MR. LEE: Your Honor, we can take this up later, but on the rebuttal case, they have the burden on damages.
01:43 THE COURT: I understand.
01:43 MR. LEE: So Mr. Chandler in rebuttal, we can come back to it.
01:43 THE COURT: We can come back to it.
01:43 MR. LEE: Dr. Conte and invalidity, we anticipate and we understand completely.
01:43 THE COURT: I understand.
01:43 MR. LEE: On the demonstrative, if I take the Intel patents off, can I use the demonstrative?
01:43 THE COURT: Mr. Chu? That -- my recollection from that demonstrative was it was -- that was the concern and that would be fine with me. That would certainly -- that would certainly cure the concern I have.
01:43 MR. LEE: I'll do that, and I won't ask. Your Honor, there will be for some of the subsequent witnesses, the fact witnesses, they will testify about their own patents that...
01:43 THE COURT: That's -- it kind of -- just, yeah, I get it.
01:43 MR. LEE: Okay.
01:43 THE COURT: Certainly they get to say, I'm an inventor too and all that. You know, we'll just have to -- and VLSI can object.
01:43 You know, the point here is to -- the ultimate point here

01:43 is to not say, we're Intel and we have a lot of patents and we
01:43 wouldn't violate their patents.
01:44 MR. LEE: I understand, and I'm not going to ask
01:44 Dr. Sylvester about the patents.
01:44 THE COURT: No, no. Certainly if your witnesses have
01:44 patents, that's part of their life story, and that's fine.
01:44 MR. LEE: Okay. Thank you, Your Honor.
01:44 MR. CHU: My understanding is there'll be no reference to
01:44 patents of any kind with respect to the demonstrative, and if
01:44 that's --
01:44 THE COURT: Let me just say, there's nothing in the
01:44 demonstrative. I don't know what -- I don't know what Intel
01:44 wants to say. So it won't be in the demonstrative, and I
01:44 discourage discussion at that time of Intel patents.
01:44 But I don't know what Intel's going to ask, and I'm not
01:44 prejudging that. Intel can ask a question, and you all can
01:44 connect -- I'm not restricting them from what they can say at
01:44 this point. They can ask a question, and as sexy as you all
01:44 think this case is, no matter what they ask about a patent,
01:44 it's unlikely to be so prejudicial that I can't cure it by just
01:45 saying, objection sustained, and the person can move on.
01:45 MR. CHU: Understood, Your Honor.
01:45 MR. LEE: To follow up on Mr. Chu's --
01:45 THE COURT: Yes.
01:45 MR. LEE: -- you would anticipate that we would close on

Monday, sometime Monday.

THE COURT: I was hoping we could close by tomorrow. I was hoping. But you all have the time that I've given you, and we'll -- what my plan is is as soon as you all -- as soon as we finish and that's within the number of hours that I've given you, we're going to do the closing arguments immediately thereafter.

And that's why my plan is tomorrow night -- I'm happy to do the charges tonight. It's just I know when I was in you all's chairs, I -- there was a lot of stuff to do. So I was hoping if we waited till tomorrow night, we'll work through everything, and it won't interrupt you all's ability to prepare for tomorrow's trial.

MR. LEE: That's great.

MR. CHU: In connection with the jury charge at the end of the case, is it Your Honor's preference to do it before or after closing arguments?

THE COURT: You know, I'm agnostic. Other than I grew up with a judge who did it that way. I've always done it where I read it first and let you all argue second.

But if, you know, there's some heartburn about that, I'm happy to hear it. But I've always read the jury charge, and then the lawyers have argued, and then the jury goes back.

MR. CHU: Thank you.

THE COURT: That's the way I prefer to do it.

01:46 MR. LEE: And, Your Honor, since I had missed the 30 minutes on the openings, do you have any time limits or expectations on the closing arguments?

THE COURT: No.

MR. LEE: Okay.

THE COURT: No time limits on the closing.

MR. CHU: Thank you.

THE COURT: So I'm going to rethink no time limits on the openings, but that's -- I'm kidding. You all both did a great job. No.

I think -- I mean, there's a counsel from the Roku trial in the back, and so I'm afraid whatever I say he might say, I was there and that's not what happened. I don't remember giving them a time limit on their closing arguments in that case either. That's my recollection. And I think they both did a great job in that case, and that -- and so I'll say this. You know, if you get to an hour, I'm going to be -- you know, an hour is a long time frame when to talk. But really it's -- you would have to really go a long way past 45 minutes, I think. I will tell you all, it may not seem like it, but I'm really trying to help you all.

MR. LEE: I understand.

THE COURT: There's just a length of time people can pay attention to closing arguments, and that's why I'm -- 45 minutes seems to be about the right amount. But I'm not

going to have a clock up here. You know, I didn't pay any attention to the clock when you all did the openings. I just listened and I thought they were great.

MR. LEE: And last question. We would expect, if it was all right with Your Honor, for Mr. Mueller and I to split the closing.

THE COURT: You can do it literally however you want to do it.

MR. LEE: Great. Thank you, Your Honor.

MR. CHU: Thank you very much, Your Honor.

THE COURT: Very good.

THE BAILIFF: All rise.

THE COURT: Please remain standing for the jury.

(The jury entered the courtroom at 1:49.)

THE COURT: Thank you all. You may all be seated.

Ladies and gentlemen, thank you for coming back.

Mr. Lee?

MR. LEE: Your Honor, ladies and gentlemen of the jury, our next witness is Dr. Dennis Sylvester.

(The witness was sworn.)

DIRECT EXAMINATION

BY MR. LEE:

Q. Dr. Sylvester, let's just do a test, make sure you're close enough to the mic.

A. Yeah, test.

01:50 Q. A little closer.
01:50 A. Test.
01:50 Q. Stay as close as you can --
01:50 A. Yep.
01:50 Q. -- for the court reporter. Okay?
01:50 Good afternoon.
01:50 A. Good afternoon.
01:50 Q. Would you introduce yourself to the jury, please?
01:50 A. Sure. My name is Dennis Sylvester. I'm a professor of electrical engineering in computer science at Michigan, University of Michigan. I conduct research and teach there and live in Ann Arbor with my wife and two teenage boys.
01:51 Q. What is your position at the University of Michigan?
01:51 A. So professor of electrical engineering and computer science.
01:51 Q. How long have you been a professor at the University of Michigan?
01:51 A. 21 years.
01:51 Q. Can you describe your educational background?
01:51 A. Yeah. So I got my bachelor's degree in electrical engineering from the University of Michigan in 1995, and then I went to graduate school and got my master's degree and Ph.D. in also electrical engineering from the University of California at Berkeley.
01:51 Q. And what did you do after receiving your Ph.D.?

01:51 A. So I spent about a year working in San Jose, California for a company called Synopsis.

01:51 Q. What were you doing while working for that company?

01:51 A. So I worked at that time on automatic design of low power circuits.

01:51 Q. What type of research do you focus upon at the University of Michigan?

01:51 A. So my research is really about low power integrated circuits, low power -- low voltage memories, power management circuits, things like that.

01:52 Q. What classes do you teach?

01:52 A. I teach both graduate classes and undergraduate classes in digital integrated circuits.

01:52 Q. Have you published any papers related to integrated circuits?

01:52 A. Yeah. I published over 500 papers in those topics.

01:52 Q. Have you specifically published any papers related to power management and low voltage memories?

01:52 A. Yeah. Quite a few of those were on those topics specifically.

01:52 Q. And have you received any patents of your own on integrated circuit technology?

01:52 A. Yeah. I think I hold 51 patents right now.

01:52 Q. And I'm going to ask you to be immodest on your own behalf just for a second. Have you won any awards for your

work?

A. Yeah. I've been fortunate enough to win some awards. Conferences give best paper awards to the top paper at a conference. I've won a number of those. I'm a fellow of my professional society, the IEEE.

MR. LEE: Your Honor, we offer Professor Sylvester as an expert in the field of integrated circuits.

MR. CHU: No objection.

THE COURT: He'll be so offered.

BY MR. LEE:

Q. Professor Sylvester, what have you been asked to do in this case?

A. So I was asked to independently assess whether a set of accused products from Intel infringed upon a specific patent, the '373 patent.

Q. What opinion have you reached on that issue?

A. So my opinion at the end of that analysis is that the products that are accused do not infringe on this '373 patent.

Q. Have you prepared a set of demonstratives to help guide us through your testimony today?

A. Yes. I have.

Q. Are you being compensated for the time you've spent in this case?

A. Yes. I am.

Q. How much an hour?

01:53 A. $450.
01:53 Q. Does your compensation depend in any way on the opinions you offer?
01:53 A. No. It does not.
01:53 Q. Does it depend in any way on the outcome of the case?
01:53 A. No. Not at all.
01:53 Q. Have you ever testified in court before?
01:53 A. No. This is the first time.
01:54 MR. LEE: Could I have DDX-7.2 on the screen?
01:54 BY MR. LEE:
01:54 Q. Using DDX-7.2, could you describe for us what materials you reviewed?
01:54 A. Sure. So the first thing I did, of course, was thoroughly read the '373 patent in its entirety, but specifically now focusing on the Claims 1, 5, 6, 9 and 11, which are the asserted claims in this case. I also looked at the prosecution history or file history of the '373 patent, how it was issued and that process.
01:54 I looked at a lot of Intel documentation. That was schematics, source code, specification documents, Intel engineers' depositions over the last summer largely, and then I also carefully read Dr. Conte's reports as well as his deposition transcripts.
01:54 Q. Were you present for the testimony of Jonathan Douglas this morning?

01:54 A. Yes. I was.
01:54 MR. LEE: Could I have DDX-7.3?
01:54 BY MR. LEE:
01:55 Q. Before we get into the specifics of your analysis, could you remind us at a high level just how the microprocessor works?
01:55 A. Yeah. Sure. So I think you've heard it said a couple of times already in this case, you know, that the processor is like the brain of the computing system. And I think that's a valid, accurate way of thinking about it.
01:55 You know, what we've shown on the right here of this demonstrative, I've chosen to show the core, which is the -- again, executes the instructions and things like that, does the actual computations, the memory, which is another major component on the processor, and then a couple of other things I'll highlight.
01:55 Q. So the box shown in dark blue is the core?
01:55 A. That's right.
01:55 Q. And the box shown in light blue?
01:55 A. Yeah. That's the memory.
01:55 Q. And there's a circle between the core and the memory. What is that?
01:55 A. Yeah. That's a clock. It's just meant to indicate that there is a clock that synchronizes the activities of the entire processor, or there's multiple clocks often, and the

frequency at which -- or the rate at which the clock runs. How fast is an indication of how quickly it can execute the instructions.

Q. And there is a battery-shaped rectangle at the bottom. What is that?

A. Yeah. So that is the power source for the microprocessor. There could be multiple voltages being supplied to the different components, but that's basically providing power to operate those components.

Q. What, if any, is the relationship between frequency and voltage?

A. So generally that has a relationship where you turn up the voltage and the frequency can increase, so they kind of move together in that way.

MR. LEE: Could I have DDX-7.4 on the screen, please?

BY MR. LEE:

Q. Do you have that before you?

A. Yes.

Q. What does DDX-7.4 show?

A. So this kind of zooms in a little bit on the memory because we're going to be talking about that today. So it shows you the general structure of what a memory on a processor looks like.

There's an array of these small squares which are called bit cells that hold the data. And then there's other boxes

around the edges which allow the memory to be read from or written to, for instance.

Q. What is a bit cell?

A. So a bit cell is sort of this fundamental unit that holds a bit of information, a one or a zero. And a memory is made up by replicating this bit cell many, many, many times to hold more data.

Q. Are all of the bit cells in a memory the same?

A. So they're nominally the same, which means the designer, you know, puts down the same thing many times. But then when it's actually manufactured, due to variations and you can't perfectly make them the same every time, there's some small differences between them.

Q. You appear to have included multiple copies of the microprocessor; is that right?

A. That's right.

Q. Why?

A. Well, this is just to indicate the same idea, that across many chips of course there's, you know, you replicate the chips many times and -- to sell different ones. Nominally, they're all identical, those bit cells, across the chips but they're again varying a little bit between them as well.

Q. And are some of those variations a result of manufacturing variances?

A. Yeah. That's right.

01:58 Q. It's the same concept we know of -- in manufacturing almost anything, correct?

01:58 A. That's right. There's tolerances. Yeah.

01:58 MR. LEE: Could I have DDX-7.5, please?

01:58 BY MR. LEE:

01:58 Q. Why are the bit cells on the right-hand side sized differently?

01:58 A. Yeah. So this is meant to kind of indicate that, you know, because of these variations, the bit cells are going to come out -- you can visualize them as a little bit bigger or a little bit smaller than they were supposed to be. That's one way to think about it.

01:58 And so then here, for example, this memory has, you know, different size bit cells, slightly, inside of it.

01:58 Q. And what is shown on the left-hand side of the demonstrative?

01:58 A. So that's the voltage. I'm eventually going to animate that, but that's the voltage at which each of those size bit cells can operate.

01:59 Q. And what is -- withdrawn.

01:59 MR. LEE: If we could have DDX-7.6 on the screen, please.

01:59 BY MR. LEE:

01:59 Q. This demonstrative adds something called the "minimum operating voltage." Do you see that?

01:59 A. Yes.

01:59 Q. What is the minimum operating voltage of memory?
01:59 A. So that is the memory -- or excuse me -- the voltage at which if you go below that the memory is no longer able to function in some way.
01:59 Q. What is the relationship between the minimum operating voltage for the memory and the minimum operating voltage for individual bit cells?
01:59 A. Well, because the memory's made up of a lot of different bit cells and there are differences among those bit cells, the minimum operating voltage of the memory, collectively, is set by the bit cells that are going to fail at the highest voltage, okay? And I'm going to show an animation here that kind of shows that process.
02:00 Q. That was my next question. Have you prepared an animation that will help illustrate that process for the jury?
02:00 A. Yeah.
02:00 MR. LEE: Could I have DDX-7.7, please?
02:00 BY THE WITNESS:
02:00 A. Okay. So let me just talk through this, I guess.
02:00 BY MR. LEE:
02:00 Q. Yes. Go ahead.
02:00 A. That might be easiest. So in this case I've now populated the bit cells with data. Ones or zeros, like again that's what they're going to hold.
02:00 Now, in this case, the yellow dot on the scale indicates

that the voltage being applied to this memory is fairly high. It's above that minimum operating voltage line that I've drawn.

Now, this means that if I apply a high enough voltage, the memory's going to work perfectly, right? That is what we expect and the data's all correct here in the memory array, and I have that green checkbox to say this memory function is just fine at that voltage.

Now, if you step to the next animation.

Now, if I turn down that voltage, I'm still here at least as great as that minimum operating voltage, and actually the memory's still going to work then. Okay. And the ones and the zeros are all correct, and I have that green check still.

Now, if I --

Q. If we advance the animation?

A. Yeah. Advance the animation.

And now we are getting to a point where I'm applying a voltage of the entire memory that's actually less than the minimum operating voltage of some of the bit cells, right?

And so you can see now in the array on the right, there's question marks for those small bit cells. Those bit cells are not -- no longer operating. Those are failing.

The other ones still function. So the memory's partially working, but that's not good enough. We need the whole memory to work. So this memory has now failed, and that's why we have that X.

Q. And if we advance animation.

A. Yeah. And as you continue to reduce the voltage further, more and more bit cells are going to fail and the memory is still remaining to be nonfunctional.

MR. LEE: Now, could I have DDX-7.8 on the screen, please?

BY MR. LEE:

Q. Using DDX-7.8, could you explain to us, what are the different types of minimum operating voltages for memory?

A. Sure. So the memory kind of has three tasks really. You need to be able to read data out of the memory, write new data into the memory, and you need to be able to just hold the data or retain the data, right? That's the jobs of the memory.

Each of those tasks has a different complexity or, you know, a different minimum voltage associated with it, so there could be a minimum retention voltage and a minimum read and write voltage, for instance.

Q. Now, if I look at the voltage regulators in the center, the voltage regulator for the minimum retention voltage seems slightly lower than the minimum read/write voltage; is that right?

A. Yeah. That's right.

Q. And why is that?

A. Well, you know, in retention, you're just sort of sitting there holding the data. It's the easiest task for the memory to do, okay? And so, therefore, it requires the least

amount of voltage to do that. So a minimum retention voltage is the lowest of these voltages listed here on this slide.

Q. Now, using the demonstrative, can you explain to us how to determine a minimum operating voltage of a memory?

A. Yeah. So to determine that, you need to really test the memory. And to test it is kind of costly in terms of time, you know, and I've done this before in my own lab.

You have to basically apply voltage for a retention, for instance, write date into the memory confidently and then reduce the voltage, let it sit there for awhile, see if it forgets and wait, you know, bring it back up again, read it out. Does it give you the right data? If yes, you go back, you do the whole thing again at a lower voltage, and you have to iterate constantly to do this.

Q. And does the manufacturing variation of the bit cells have an effect on what the minimum retention voltage, for instance, would be?

A. Yes. It does.

MR. LEE: Now, could I have DDX-7.9, please?

BY MR. LEE:

Q. Is there an everyday analogy --

THE COURT: Mr. Lee, maybe it's just me, because no one else seems to have this issue, but could you pull the microphone just a little closer?

MR. LEE: Sure.

02:03 THE COURT: That's better. I can hear you a little better. Thank you.

02:04 MR. LEE: Could we have DDX-7.9, please?

BY MR. LEE:

02:04 Q. Do you see that?

02:04 A. Yes, I do.

02:04 Q. Is there an everyday analogy that you could use to help explain the relationship among the different types of minimum operating voltages?

02:04 A. Yeah. So since the -- you know, the second most popular thing at this trial, besides processors, is vehicles, I guess we'll stick with vehicles.

02:04 So thinking about a car or truck in this case, you know, retentions like idling. The engine's running, but it's not doing really anything else. And you put that truck in neutral, and it's going to require some energy from the engine, some gas, right? So that's pretty easy. Now, that's like a retention voltage, a minimum retention voltage.

02:05 Now, if I want to move that truck, it weighs 4,000, 5,000 pounds, it's going to, you know, take more energy, more power from the engine. So I put that in gear, that's going to take more voltage in the case of a memory.

02:05 So you can think of that as the minimum read voltage to move that vehicle in gear.

02:05 MR. LEE: Now, could I have DDX-7.10 on the screen,

please?

BY MR. LEE:

Q. What is the component that's depicted between the power source and the memory in this slide?

A. So that's the voltage regulator, which has been talked about a little bit in this trial.

Q. What is a voltage regulator?

A. So a voltage regulator is a circuit component that takes in an input voltage and then outputs a different voltage, an output voltage. So you have Vin and Vout typically.

Q. And what is a regulated voltage?

A. So a regulated voltage is a voltage that's stable and reliable and basically will remain that way in the face of environmental changes and things like that.

Q. How does a voltage regulator work?

A. So I have a little bit of a blowout here at the bottom that shows some of the components. And we don't need to go into detail on all these or anything, but the general idea is that you have a target that you're trying to regulate to, okay? Like 5 volts. And you basically have feedback that says the output voltage is 5 volts, everything's good.

Now, if that voltage starts to move at all, the feedback quickly changes the control element here to maintain the 5 volts at the output. So there's this feedback loop that keeps it always right at 5 volts in my example.

02:06 Q. Why, if at all, is the output of a voltage regulator not regulated?

02:06 A. Well, there's several scenarios where that would be the case. I mean, if I turn the thing off -- if I turn the control element off altogether, the output could be floating. That's definitely one example.

02:07 When I'm moving from one set point to another set point, I'm changing the voltage. It's not stable, right? It's not reliably giving you a stable output, so it's not regulated then either.

02:07 Q. Is there an analogy in our everyday lives that would help illustrate the operation of a voltage regulator?

02:07 A. Yeah. So if you click to the next slide.

02:07 So this is cruise control. This is a great example in a vehicle. Again, a cruise control is a regulated system where you're setting a target, which is speed in this case, not voltage. But speed, and the car is automatically feeding back the speed and making sure that when I start to go up a hill, it adds more throttle response to maintain that speed, right? So that same feedback loop is exactly the same concept.

02:07 Q. Now, let's turn to the '373 patent, if we could.

02:07 MR. LEE: Could I have PTX-004, the first page on the screen?

02:07 BY MR. LEE:

02:07 Q. Do you see it?

A. Yes, I do.
Q. Would you remind us what the title is?
A. Yeah. It's "Minimum Memory Operating Voltage Technique."
Q. And the owner was at the time?
A. Freescale Semiconductor.
Q. When did you first hear of the '373 patent?
A. That was in connection with this litigation.
Q. When you were retained in this case?
A. That's correct.
Q. Now, in general terms, what is the subject matter of the '373 patent?
A. So this patent deals with a way of using a minimum operating voltage for a memory. So determining what that is and then using that to decide whether it's safe to apply a voltage to the memory or not. And then having a second voltage that you could bring in, if needed, in cases where that first voltage drops below.
Q. Now, you understand that the claims determine what the invention is for a patent, correct?
A. That's correct.
Q. Have you read the entirety of the '373 patent?
A. I have.
Q. So let's look at a few of the portions that precede the claims, okay?

A. Sure.

MR. LEE: Could I have Column 2, Lines 1 to 7 of the patent on the screen?

BY MR. LEE:

Q. Do you see that?

A. Yes, I do.

Q. Would you explain to us what is being discussed in this portion of the patent?

A. So this is kind of background motivation for the patent. It talks about some of the topics we've already mentioned, voltage and frequency can change. It also mentions that the minimum operating voltages for memories may be different than that from other components, such as the processors or cores.

MR. LEE: If we could now focus on Column 2, Lines 17 to 28, please.

BY MR. LEE:

Q. Do you see that?

A. Yes, I do.

Q. What does the patent tell us about minimum operating voltage in this section?

A. So this talks about the fact that minimum operating voltage for a memory can vary from memory to memory or part to part, you know, which I've also talked about already.

And it also mentions that because there is a different

minimum operating voltage for every memory, not just part-to-part but even memory-to-memory within chips, actually, you know, you don't necessarily want to just assume one-size-fits-all for them. So the patent kind of calls that out and says that's not a good idea.

MR. LEE: If we could go back to an earlier portion of the patent in the abstract.

BY MR. LEE:

Q. Do you have that before you?

A. Yes, I do.

Q. Can you tell us what the patent abstract tells us about the minimum operating voltage technique?

A. Sure. So, you know, this pretty much spells out some of the key elements of the invention. It talks about the determination of a minimum operating voltage for the memory. It talks about the storage of that in a non-volatile memory location.

And then it says, "The minimum operating voltage information can then be used in determining when an alternative power supply voltage may be switched to the memory or ensuring that the minimum voltage is otherwise met."

So this is what I referred to earlier where, you know, you have to decide whether you can apply the first voltage or not. And if not, you have the second voltage kind of waiting in the wings.

Q. Are there any figures in the patent that are useful for illustrating this technique?

A. Yeah. Figure 1's very illustrative.

MR. LEE: Could I have DDX-7.12 on the screen?

BY MR. LEE:

Q. Have you prepared an animation that will help illustrate how the invention of the '373 patent works?

A. Yes, I have.

Q. Using DDX-7.12 and advancing through it, would you explain it to us?

A. Yeah, sure. So this shows the cover sheet, and this is Figure 1 shown on the front. So this shows the components, really, that are the elements of the invention.

And so if we click first, we'll highlight the memory array, right? That's the key here. The memory has a minimum operating voltage, as the title of the patent mentions. And that minimum operating voltage is determined in some way, right?

And then if you click to the next one, it is stored. So the minimum operating voltage of the memory is stored in these non-volatile registers. That means they never forget, right? You can turn the power off, and it will retain that data.

If we click again, then there are these two voltage regulators, okay? And I'm going to call the green one the first voltage regulator and the orange -- yellow -- yellowish

one, I guess, the second voltage regulator, okay? So we've got those components as well.

Now, if we click to the next one, we have a processor, a core we often call it nowadays. It's some functional circuit other than the memory, okay? That's what the patent typically calls it, a functional circuit.

Now, if we click again, we see the power supply selector, okay? So this has two inputs, right? Actually, there are two main inputs and then there's one bit that controls it. But the inputs are the two voltage regulators, the outputs, the actual regulated voltages, right?

And if we click again, I'm going to then go into the operation of the patent by breaking it into two scenarios, okay?

So I've repeated -- I've replicated the same figure on both sides here.

So on the left side, in the scenario where the first regulated voltage is greater than or equal to the minimum operating voltage that's been stored. Then the power supply selector selects that first regulated voltage in green, if you click, and provides that to the memory array, at the same time that the functional circuit, the processor here, also is provided or is using the first regulated voltage, okay? So that's the operation in this scenario.

The other scenario would be, as you might guess, when the

first regulated voltage is less than the minimum operating voltage. And that's on the right here.

So if we click on that, we see that, again, the first regulated voltage, for whatever reason in this scenario, is really low, okay? It's lower than the minimum operating voltage that's stored in the chip.

And if we click again, we cannot apply that green, that voltage regulator output to the memory, otherwise it will fail. That's the definition of minimum operating voltage, right?

So instead, the supply selector chooses the second regulated voltage in orange that's going to be greater than the first regulated voltage, provides that to the memory array while the first regulated voltage in green continues to be provided to or used by the functional circuit.

Q. Using integers, could you just give us a simple example of how this would work?

A. Yeah. Sometimes it's easiest to think about it with numbers. I do that in my classes a lot.

So, you know, for instance, let's say you determine that the minimum operating voltage of a memory on a particular chip is 2 volts, okay? And I'm just using round numbers here. So I would store that 2 volts in those registers.

And on the left, if the first regulated voltage that's being requested here is 3 volts, well, 3 volts is greater than 2, so the memory will work at 3 volts. So I apply 3 volts to

02:15 both the memory and the processor, and they both operate, you
02:15 know, with that same voltage.
02:15 Now, later maybe I enter a low-performance mode, okay?
02:15 Low frequency mode. And now the first regulated voltage that's
02:15 requested is 1 volt. But 1 volt is less than 2 volts, right?
02:15 It's less than the minimum operating voltage of the memory.
02:15 So now what happens is the power supply selector switches
02:15 over, chooses the second regulated voltage, which let's just
02:15 say it's 4 volts or something like that, to apply to the memory
02:15 so it can safely operate.
02:15 Meanwhile, the 1 volt, the first regulated voltage,
02:15 continues to be provided to the processor so it can do its
02:16 work.
02:16 Q. Did you hear Dr. Conte testify on Tuesday?
02:16 A. Yes, I did.
02:16 MR. LEE: Could we have Dr. Conte's demonstrative
02:16 PDX-4.33?
02:16 BY MR. LEE:
02:16 Q. So you recall Dr. Conte using the same Figure 1 in
02:16 discussing Figure 1?
02:16 A. Yes.
02:16 Q. Do you recall him suggesting that the '373 patent is
02:16 about putting circuits to sleep?
02:16 A. Yeah. I remember that.
02:16 Q. Do you agree?

A. No, I don't.
Q. Why not?
A. Well, that's not what the patent talks about. That's not what it's aimed at. And it's important that the functional circuit, which is at the far right here, is really using that or, you know, is provided a regulated voltage to -- to it to operate.
Q. Is the word "sleep" anywhere in the patent?
A. Not that I could find.
Q. Now, Professor Sylvester, if I could pull up the cover page of the '373 patent again, would you remind us the date when it was filed?
A. Yeah. That's August 30th of 2006.
Q. Now, if I go back to August of 2006, could you tell the jurors what was the state of the technology back then?
A. Yeah, sure. There was a lot of work in this area. I was actually doing some of it myself.
There was a lot of work on low voltage memories. There was a lot of work on power management techniques, you know, for mobile chips and things like that.
MR. LEE: Could I have DDX-7.14, please?
BY MR. LEE:
Q. Did you help prepare this slide?
A. Yes, I did.
Q. Could you tell us what was going on in the 1950s to

the 1970s?

A. Well, this was the early days, obviously, of the integrated circuit industry, and so people were developing ideas rapidly, basics, fundamentals, voltage regulators, how to build them out of semiconductor-based chips. Memories, these were the very first integrated circuit products were actually memories. Things like that.

Q. And as you move forward into the 1990s, what was happening in the field?

A. Well, in the '90s we started to think more about mobile devices, right? Very early laptops and things like that. Battery life became more important, and so as a result, we cared more about power than ever before.

So people started to do things like try to reduce the voltages in the chips because voltage is a strong -- or power is a strong function of voltage. Okay?

They started to work on switching between power supplies, you know, when you unplugged your computer, you know, and things like that, right?

Q. Now, the filing date of the '373 patent is in August of 2006, correct?

A. That's right.

Q. Now, there's an indication of some work on power supply switches in mux in the late 1990s. Can you describe that to us?

02:18 A. Yeah, this was just, like I said, you know, the idea
02:19 of having two different voltage supplies and then switching
02:19 between them based on some criteria like unplugging your
02:19 laptop. It might move into a lower voltage state to retain
02:19 battery life or something like that.
02:19 Q. So is it correct then that integrated circuits,
02:19 memories, voltage regulators, microprocessors, voltage scaling,
02:19 power supply switches, muxes were all known and had been worked
02:19 on by others before the date of the filing of this patent
02:19 application?
02:19 A. Yeah. Actually, I was doing some work before that
02:19 date myself on power supply switching, on very low voltage
02:19 memories, minimum operating voltage and memory. So yes.
02:19 Q. Now, Professor Sylvester, you understand that Intel
02:19 has not challenged the validity of the claims -- of the patent
02:19 claims in this case, correct?
02:19 A. That's right.
02:19 Q. In your view, is the state of the art and its
02:19 development relevant to the value of the patent?
02:20 A. Yes, it is.
02:20 Q. Okay. Now, did you review the prosecution history of
02:20 the patent?
02:20 A. I did.
02:20 MR. LEE: Could I have D-598, please, on the screen?
02:20 BY MR. LEE:

02:20 Q. Can you tell us what this is?
02:20 A. Yeah. So this is the application that the inventors originally filed for the techniques of the '373 patent.
02:20 Q. Do you recall on Tuesday that I asked Dr. Conte some questions about the back-and-forth between the applicants and the Patent Office?
02:20 A. Yes. I remember that.
02:20 Q. All right. Now, I asked Dr. Conte about the original claim that had been applied for in the original application. Do you recall that?
02:20 A. Yes.
02:20 Q. What did the Patent Office do in response to the original request for claims?
02:20 A. So they rejected all the claims.
02:20 Q. What did Freescale do after that?
02:20 A. So Freescale amended the claims. They merged some of the claims together, added a few requirements to try to narrow them so that they could be potentially patented.
02:21 MR. LEE: Could I have Pages 73 to 74 of D-598, please?
BY MR. LEE:
02:21 Q. Do you have that page before you?
02:21 A. Yes. I do.
02:21 Q. And let me ask Mr. Lee to put together from Pages 3 and 4 the proposed claim 11 from Freescale. Do you see that?
02:21 A. Yes.

02:21 Q. Could you explain to us what is shown on the screen?
02:21 A. Yeah, so this was after the response by the patent -- or the inventors. They amended the claims that were originally rejected, and this is a merged version of a couple of the claims.
02:21 Q. Now, the jury will have this exhibit with them in the jury room. What does the underlining mean?
02:21 A. Yeah, so the underlining was actually originally part of a different claim in the original application. I believe it was Claim 12 at that point, but now it's been combined into one larger claim here.
02:22 Q. And if I were to highlight the "wherein" clauses, these are underlined, correct?
02:22 A. Yes.
02:22 Q. So these are things that Freescale is adding in order to get the Patent Office to give them a patent, correct?
02:22 A. Well, yeah. The highlighted and underlined portions specifically were completely new to the revision. Yes.
02:22 Q. And what did those completely new aspects of the claims concern?
02:22 A. Well, the first one just talks about the fact that the second regulated voltage needs to be greater than the first. Okay?
02:22 Q. So that's your example of three is greater than two?
02:22 A. Yeah, or four is greater than whatever. Yeah.

Exactly.

And the second one is actually the -- it talks about the fact that in the scenario on the right -- if you remember, I had the left and the right scenarios -- in the scenario on the right where the memory is getting the second voltage, that first voltage which is low needs to still be, in this case, A, regulated and, B, used by the processor.

Q. And what happened after Freescale said, we'll limit our claims in this way?

A. So at that point the Patent Office granted the patent.

Q. And what does that prosecution history tell you as a person of skill in the art about the importance of these limitations?

A. Well, I mean, it tells me that, you know, the original application was anticipated by other -- or the work and then they had to narrow their claims, add a few requirements in order to get the patent issued.

Q. Now, "anticipated by other work," would you explain to us what that means?

A. Oh, that just means there was prior work that made the invention obvious or just not patentable.

Q. Right. Now, how does the claim on the screen now, Claim 11, relate to the issued claims of the '373 patent?

A. So this claim here in its entirety is identical to

Claim 9 of the issued patent.

Q. So when the jury looks at Claim 9 of the patent, they will see this claim?

A. Correct.

Q. And they will see the wherein clauses that were added to get it out of the Patent Office, correct?

A. That's true.

Q. Now, in connection with your work, did you review the depositions and hear the testimony of Mr. Bearden and the deposition testimony of Mr. Zhang?

A. Yes. I did.

Q. Were either of them able to identify any products they had using the '373 patent?

A. No. They weren't.

Q. And in the course of all your work, have you seen any evidence that anyone or any company used the '373 patent technique in a product?

A. I have not.

Q. All right. Now, let's turn to your analysis of Dr. Conte's opinions. Okay?

A. Sure.

Q. You told me you were present during Mr. Douglas' testimony, correct?

A. Yes.

Q. And when Mr. Douglas and Mr. Mueller assembled

DDX-5.5, the magnet board --

A. Yes.

Q. -- you were here for that process?

A. Yep.

Q. Now, first at a high level, remind us where the C6 SRAM is located on the board.

A. On the board right there, it's the blue, small blue rectangle on top of the LLC, the green region.

Q. And what is the function of the C6 SRAM?

A. It's basically a backup memory. It's a memory that holds some important state for the cores and things when the cores and other components go to sleep and otherwise would forget what they were holding.

Q. Now, is the C6 SRAM the only memory in the microprocessor?

A. No.

Q. How many more memories are there?

A. I couldn't give a specific number, but, you know, there's many.

Q. And is it the only memory within the ring domain?

A. No.

MR. LEE: Now, if I could have DDX-7.15 on the screen.

BY MR. LEE:

Q. Using DDX-7.15, can you explain to us what's shown on the left-hand side of the diagram?

02:26 A. Yes. So the left-hand side is showing the operation of the voltages associated with the C6 SRAM and the ring domain, when the processors, the accused processors here, like the Haswell and Broadwell processors are either active or in a shallow sleep state.

02:26 Q. And what is the name of the voltage that both the C6 SRAM and the other RAM components receive?

02:27 A. So in this -- in these states, the entire ring domain receives VCCR, again where the R stands for ring, so it's easy to kind of keep in mind.

02:27 Q. So what is shown on the right-hand side of this slide?

02:27 A. So the right-hand side shows you when you move into these deep sleep states, specifically the Package C7 state that we've heard about in the trial so far, and this shows you the voltages and what they're doing and the ring domain and what the various components are doing in that state.

02:27 Q. And what happens in that state?

02:27 A. Well, what happens in that state is that the mux that's shown here, the multiplexer now selects the VCCIO voltage to be applied to the C6 SRAM.

02:27 However, the rest of the ring domain does not receive a voltage at all. It doesn't receive VCCR because VCCR is turned off altogether.

02:27 Q. So what happens to the ring domain when this C6 SRAM

is switched to this alternative voltage?

A. It's powered down.

Q. Now, you mentioned the Package C7 state. What is the Package C7 state?

A. That's just a deep sleep state associated with the microprocessors that allow you to reduce the amount of power they consume when you're not actively doing much at all.

Q. So let's get to the specific infringement question that the jurors will ultimately decide.

MR. LEE: Could I have DDX-7.16 on the screen?

BY MR. LEE:

Q. What claims of the patent is VLSI asserting against Intel?

A. Well, so they're asserting two independent claims, so 1 and 9. And then they're asserting three dependent claims that stem from those, so 5 and 6 depend on 1, and then Claim 11 is asserted, that depends on 9.

Q. What differences, if any, are there between independent Claims 1 and 9?

A. There's a few differences. You know, you can see at the beginning the left one it says "a method" and the right one says "an integrated circuit." So one's called a method claim. One's called an apparatus claim. So that's one difference.

Q. Now, have you reached an opinion concerning infringement of these claims by Intel's C6 SRAM feature and its

Haswell and Broadwell products?

A. I have.

Q. What definitions of the words in the claim did you use?

A. Well, so I used the plain meaning of the terms in all the claim language to a person of skill in the art.

Q. If I could have DDX-7.17.

Could you use this slide to summarize the reasons you have found no infringement, and I'll then take you through each of them in more detail.

A. Okay. Yeah.

So the first one -- I've got three things listed here. So there are three major reasons that I have concluded that the products do not infringe.

The first one is that the products don't determine or store the minimum operating voltage of the C6 SRAM, the accused memory. And that's required by the claims.

Secondly, the C6 SRAM's voltage is not provided or selected when VCCR is at least, or when VCCR is less than the minimum operating voltage, which is also directly in the claim language.

And then finally, the fact that VCCR itself is not regulated in the Package C7 state also means the claim requirements are not met.

Q. Do these conclusions apply to all of the claims that

VLSI asserts against Intel?

A. Yes, they do.

Q. All right. So let's look at them in a little bit more detail.

MR. LEE: Could I have DDX-7.18 on the screen?

BY MR. LEE:

Q. And your first reason was that the Intel products do not determine or store the minimum operating voltage of the C6 SRAM, correct?

A. That's correct.

Q. Where in the claims is this requirement?

A. Well, in Claim 1 I've highlighted the determination aspect and then the storage aspect in yellow and blue, respectively.

Q. Where in Claim 9 do we find these requirements?

A. So if you click, I think I put a -- I may have put it on the right here. The wording's a little bit different in 9, right? So I've highlighted in blue that the claim requires a memory location that stores a value representative of the minimum operating voltage.

Q. Now, there's a reference to "the memory," correct?

A. Yes.

Q. From all of the memories in the Intel microprocessors, what is the memory that Dr. Conte says is "the memory" for purposes of infringement?

02:31 A. He's identified the C6 SRAM specifically.
02:31 Q. And is that the only memory from all of the memories in the Intel microprocessors that he's identified?
02:31 A. Yes.
02:31 Q. And what are the reasons that you have concluded that these two -- these limitations on the screen now are not satisfied or not met by Intel's products?
02:32 A. Well, I looked at all the materials I mentioned before in terms of design documents, specifications, engineers' testimony and also found some data of my own that demonstrates that there is no such value here that's being stored.
02:32 Q. Is there a reason that Intel doesn't test for and then store a minimum operating voltage for the C6 SRAM portion of the ring domain?
02:32 A. Yeah. Actually, there's several reasons.
02:32 Q. What are they?
02:32 A. Well, for one, I mentioned this a little bit earlier, testing for a minimum operating voltage and determining it is actually a very time-intensive task. You're constantly checking and checking and reducing. That's costly because testing time costs Intel money on each part.
02:32 Also another reason is that you saw that the C6 SRAM resides within this large ring domain, okay? And all the testing Intel does in their products is at the domain level. So they're testing this big set of circuits. They're not

testing specifically the C6 SRAM. That would be a lot more complex, okay? And --

Q. Now -- I'm sorry. Go ahead.

A. Well, you know, so there's another reason, which is that the knowledge of that minimum operating voltage, even if they decided to do all of that, wouldn't help them in the sense that they don't use that value to make any decisions on when to change the voltage of C6 SRAM.

Q. So let's keep ourselves focused on the C6 SRAM which Dr. Conte says is the memory that infringes, okay?

A. Okay.

Q. Dr. Conte mentioned the testing and fusing of something called RING_RETENTION_VOLTAGE. Do you recall that?

A. Yes.

Q. And he says that that satisfies the claims, correct?

A. He does say that, yes.

Q. Do you agree?

A. No, I do not.

Q. Why do you disagree?

A. Well, the RING_RETENTION_VOLTAGE is not a minimum operating voltage or a minimum retention voltage of the memory -- of the C6 SRAM specifically.

Q. And it's RING_RETENTION_VOLTAGE, correct?

A. That's right.

Q. Are there parts of the ring in addition to the C6

SRAM?

A. Yes.

Q. It's not the C6 SRAM retention voltage, correct?

A. That's right.

MR. LEE: Now, Your Honor, I'm going to have to go on the -- to seal the courtroom. It's only for a couple pages, and I'll go immediately back on the public record, but it's to deal with the source code.

THE COURT: Absolutely fine with me.

MR. LEE: Okay.

THE COURT: If you are not under -- I'm sorry. If you're not under the protective order, if you -- we'll give you a few seconds to dismiss yourselves. And we'll also go off of the public record in terms of the publication of the audio.

Mr. Lee, I think you're in good shape.

(Sealed proceedings.)

MR. LEE: Your Honor, we can go back on the public record.

THE COURT: Okay.

BY MR. LEE:

Q. Now, what did you do with this data?

A. So I looked at it. Continue?

Q. Just a second. So let me restate the question to put us all -- to level-set us all.

What did you do with the data?

A. So I had sort of put in that histogram form so I

could tell what was fused into all these millions of actual accused products. And I was looking at the RING_RETENTION_VOLTAGE values, which was the accused minimum retention voltage of the C6 SRAM. And I looked at another parameter which was the Ring_VF_Voltage_0 parameter for the same parts.

MR. LEE: Could I have DDX-7.20 on the screen?

BY MR. LEE:

Q. What did you determine from your analysis of the histogram data you just described?

A. Yeah. So this kind of summarizes the data across those millions of parts, as I mentioned. So here the Haswell at the top shows that the median value, right, so half are greater, half are less than. That's just what was used here. Median value of the RING_RETENTION_VOLTAGE converted to actual voltage level is .76 volts.

And for the Broadwell for the same parameter, the RING_RETENTION_VOLTAGE as we saw, actually the raw data, pretty much every single part had the same value, and that was 0.7500 volts. So that data is collected here.

And then I also collected the Ring_VF_Voltage_0 data, okay? And that one I'm reporting out here the median result for that. And you can see that it's actually less than the RING_RETENTION_VOLTAGE in both cases by a good margin.

Q. Now, let's take them each in part.

So for Haswell the RING_RETENTION_VOLTAGE is what Dr. Conte says is the minimum operating voltage, correct?

A. Yes. That's right.

Q. And that is .7617 across all of these products that you looked at, correct?

A. The median value, yes.

Q. Okay. The ring is .6719 volts, correct?

A. Right.

Q. And that's the median across all of these products?

A. All the Haswell parts that I analyzed, yeah.

Q. Were you here when Mr. Douglas testified that at RING_VOLTAGE_0, the memory is still operating?

A. Yes, I was.

Q. Is that consistent with what you found?

A. Yes, it is.

Q. So for Haswell the memory is actually working below what Dr. Conte says is the minimum operating voltage?

A. That's right.

Q. What does that tell you about whether it's a minimum operating voltage?

A. Well, it told me that that's just not the case. It's clearly not the minimum retention voltage.

Q. And if we look at Broadwell across all of these products, the median was .750 for the RING_RETENTION_VOLTAGE, correct?

02:42 A. That's right.
02:42 Q. And the median for RING_VOLTAGE_0 was .6172?
02:42 A. Correct.
02:42 Q. What does that tell you about whether the RING_RETENTION_VOLTAGE is a minimum operating voltage?
02:42 A. Same conclusion, that, you know, this is clear evidence that the RING_RETENTION_VOLTAGE is not a minimum retention voltage.
02:42 Q. And to be a little bit more specific, when we have ring, what is happening to the ring?
02:42 A. The ring is -- and RING_VOLTAGE_0? Is that what you said?
02:42 Q. Yes.
02:42 A. It's operating. The ring is working. Typically, I believe, in these products it's running at about 800 megahertz at that point. So it's just doing its task at 800 million times a second.
02:42 Q. Would you explain to the members of the jury why you used medians to compute these values?
02:42 THE COURT: Mr. Lee, again, I'm having a hard time hearing you.
02:43 BY MR. LEE:
02:43 Q. Would you explain to the jury why you use medians to compute these values?
02:43 A. Well, in some of these cases there's distributions,

and I'm trying to kind of boil it down to one number. So that's one thing.

Dr. Conte, his original report actually reported the RING_RETENTION_VOLTAGE medians as well, so I was following that convention. And it's also a good way just to represent data that is fairly consistent but maybe has a few outliers that you kind of want to just ignore.

Q. Have you prepared a demonstrative to illustrate how the memory operates below what Dr. Conte says is the minimum operating voltage?

A. Yes.

MR. LEE: Could I have DDX-7.21, please?

BY MR. LEE:

Q. Do you have that on the screen?

A. Yes.

Q. Can you tell us what is shown on the screen and what that tells you about whether RING_RETENTION_VOLTAGE is a minimum operating voltage?

A. Right. So on the right here, we actually have this curve, and I believe your co-counsel had drawn it up actually during Mr. Douglas' testimony, but this is actually a more representative kind of looking diagram for the VF curve, the voltage versus frequency relationship of the ring, for instance.

And this is showing you the Ring_VF_Voltage_0 resides at

that bottom point here, that blue dot. We've shown you the data for that. So we know that the ring operates perfectly well down to those voltages. And it's significantly lower than the RING_RETENTION_VOLTAGE, which has been identified as a minimum regulated voltage for the C6 SRAM.

Q. And to be clear, if we focus on the diagram on the right-hand side, do you see that?

A. Yes.

Q. And there's a red arrow and a red line with arrows pointing up and down right above Ring_VF_Voltage_0, correct?

A. That's right.

Q. And in that range, is the memory operating or is it not?

A. The memory can fully operate in that range.

Q. All right. Now, we've just heard that the -- you just told us that the RING_RETENTION_VOLTAGE is not a minimum operating voltage for the ring, okay?

Did you find anything in the Intel documents that referred to a minimum retention voltage for C6 SRAM?

A. No. I did not.

Q. Let me bring up DDX-7.22 and ask you this question: Is it correct to take the RING_RETENTION_VOLTAGE for the whole ring domain and assume that it's the same as the C6 SRAM as Dr. Conte does?

A. No. You can see here in this diagram that the ring

02:46 contains a lot of different components. And, you know, the LLC
02:46 here is drawn the largest because it is by far the largest, and
02:46 that's actually relevant here in my conclusions as well.
02:46 Q. Does Dr. Conte agree with you that the ring domain
02:46 includes all the components that are identified on DDX-7.22?
02:46 A. He does.
02:46 Q. All right. So if this RING_RETENTION_VOLTAGE fuse is
02:46 a -- I'm sorry. Is this RING_RETENTION_VOLTAGE fuse a voltage
02:46 setting for the C6 SRAM specifically or the entire ring domain?
02:46 A. It's for the entire ring domain.
02:46 Q. And is there a good technical reason why you would
02:46 set it for the entire ring domain?
02:46 A. Well, the use of the RING_RETENTION_VOLTAGE in the
02:46 products is in the C3 or C6 states, where the ring is just sort
02:47 of parked there and idling. And so the whole ring in that case
02:47 is going to be retaining, so you want to make sure that
02:47 everything in there can retain.
02:47 Q. Now, if I turn you to DDX-7.23, can you just tell the
02:47 jurors, remind the jurors, what is the relative size of the C6
02:47 SRAM to the last-level cache?
02:47 A. The last-level cache is about 50 times larger than
02:47 the C6 SRAM in terms of its capacity.
02:47 Q. And is there a simple way to think about that?
02:47 A. Well, yeah. So the key idea here, the argument that
02:47 I'm trying to get across with this demonstrative, is that if

you just could measure the minimum retention voltage of the memories here, if you could do that, it's much, much more likely, because of the size of the LCC, that it is going to contain those bit cells that are going to fail at the higher voltages.

If you remember that animation I drew with the yellow dot moving down, where some of the bit cells failed first, okay, those bit cells are going to be distributed across this whole diagram.

And because the LLC is so much bigger, there's much, much more likely to be there and set the minimum retention voltage of this entire set of memories, not the C6 SRAM, which is quite small.

Q. Is there a simple way to think about how this size difference matters --

A. Yeah.

Q. -- in making the equation that Professor Conte's making?

A. Yeah. So I think if we click -- there's a little jar here of marbles. And there's maybe 50 green marbles and one blue marble, right? So this is like blindly reaching into the jar, you pull out a marble, you know, you're going to get a green marble 98 percent of the time.

So that's the same thing with getting these bit cells that are kind of bad over here. It's going to be in the LLC almost

all the time.

MR. LEE: Can I have PTX-3662 on the screen?

BY MR. LEE:

Q. Do you see that, Dr. Sylvester?

A. Yes. I do.

Q. Is this one of the documents you reviewed?

A. Yes. That's right.

Q. Could we turn to Page 702, and I'd like to ask you about something Dr. Conte said about this page.

A. Okay.

Q. Do you have that before you?

A. Yes.

Q. And do you remember Dr. Conte focusing on the RING_RETENTION_VOLTAGE passage?

A. Yes.

MR. LEE: Could we have that?

BY THE WITNESS:

A. Yes.

BY MR. LEE:

Q. Does this portion of the specification show that RING_RETENTION_VOLTAGE is a minimum retention voltage of the C6 SRAM?

A. No. It doesn't.

Q. Why not?

A. Well, for example, this is a ring-specific value, so

the marble analogy comes into play here, right? This is a -- this has a lot of other circuit components associated with it. It's not isolated to the C6 SRAM. That's one reason.

The other reason is just that it doesn't say it's a minimum retention voltage. It says it's a "worst case retention voltage," which is not the same.

Q. And when you reviewed the Intel documents, did you find any Intel documents that referred to a worst-case retention voltage for the C6 SRAM as distinguished from the ring?

A. No.

MR. LEE: Now, if I could have DDX-7.25 on the screen.

BY MR. LEE:

Q. How does your conclusion concerning the C6 SRAM and the RING_RETENTION_VOLTAGE factor into your first reason that Intel doesn't infringe?

A. Well, since I found a couple, you know, clear pieces of evidence to me that showed that the RING_RETENTION_VOLTAGE is not the minimum retention voltage, or any minimum operating voltage of the C6 SRAM, then, therefore, the products aren't meeting these requirements.

Q. Is it correct to state that what you found was that the minimum operating voltage that Dr. Conte identified is not a minimum operating voltage for the memory he identified, correct?

02:51 A. That's right.
02:51 Q. And the minimum operating voltage that he did identify for the entire ring domain is not a minimum at all?
02:51 A. That's correct.
02:52 Q. Okay.
02:52 MR. LEE: Now, let's bring up DDX-7.2.
02:52 BY MR. LEE:
02:52 Q. Can you remind us what your second reason was that there's no infringement of the '373 patent?
02:52 A. Yeah. So I'm going to be talking about a different claim requirement here, but this has to do with the operation of the accused power supply mux. And it does not provide or select, based on when VCCR is at least or less than a minimum operating voltage.
02:52 Q. So if we go to DDX-7.27, I'm going to put Claim 1 back on the screen.
02:52 Would you explain to the jurors where in the claim these requirements are found?
02:52 A. Yes. So looking at the highlighted requirements, so the two shown there, I've underlined some keywords, right? So we need to provide a voltage, either the first or second regulated voltage, to the memory when the first regulated voltage is either at least the value of or is less than the value of the minimum operating voltage.
02:53 Q. So you mentioned the word "when." That is in the

claim explicitly twice, correct?

A. That's right.

Q. And you understand that for infringement purposes every word counts?

A. That's right.

MR. LEE: Turn to DDX-7.28 if you would.

BY MR. LEE:

Q. Can you explain to us what you have depicted on DDX-7.28?

A. Yeah. So this is like a decision tree, right, you know, trying to figure out how this -- how these claims map to operation.

I've kind of showed this earlier in a certain way, but this is a different way of looking at it. And I've color-coded it so the different requirements map to the different sort of parts of the process or method on the right.

Q. All right. So -- and you had the limitations on the left, correct?

A. Uh-huh. That's right.

Q. And you have -- you've basically mapped them to the diagram on the right, correct?

A. Yeah. So, for instance, to start, the first one's in blue, you know, you need to store the minimum operating voltage of the memory, which we've already talked about.

Then you have this decision tree, left or right, here.

And the yellow is that when the first regulated voltage is either at least or less than, those are the two scenarios, right?

And when the first regulated voltage is at least the minimum operating voltage, then you go ahead and move down to the left and you provide that first regulated voltage to the memory, right?

The alternative scenario is in orange that, you know, when it's less than the value, I go to the right and I go ahead and provide the second regulated voltage as the operating voltage of the memory.

Q. And what are the reasons you concluded that Intel does not meet the requirements of the claim on the left?

A. Well, the products don't work this way. So the power supply selector, the power supply mux, as it were, that's -- it doesn't have anything to do with the minimum operating voltage, for instance, which is in these claim requirements explicitly.

Q. And how does that conclusion apply to the other asserted claims?

A. Same conclusion. It demonstrates noninfringement.

Q. Have you reviewed the actual source code that describes the operation of the C6 SRAM power mux?

A. Yes. I have.

MR. LEE: And, Your Honor, we'll have to seal again for just a very brief time to look at the source code.

02:55 THE COURT: I don't believe there's anyone in the -- anyone needs to leave, but I don't believe there's anyone left.

02:55 (Sealed proceedings.)

03:02 MR. LEE: Could I have DDX-7.30 on the screen, which is now Claim 9, another claim asserted by VLSI?

03:02 BY MR. LEE:

03:02 Q. Can you explain to us why Claim 9 -- this portion of Claim 9 is not satisfied?

03:02 A. Yeah, so this portion is similar in a lot of the language, but it calls out specifically a component, right, the power supply selector, which is being pointed to as the C6 power mux component, and for the same reasons, it doesn't operate in the way that's required by the claims. There's no reference to any value of the minimum operating voltage in its switching.

03:03 Q. Is there a third reason you have concluded that Intel C6 SRAM does not infringe the '373 patent?

03:03 A. Yes.

03:03 Q. What is the third reason?

03:03 MR. LEE: And could I have DDX-7.31?

03:03 BY THE WITNESS:

03:03 A. So this one has to do with sort of a different part of the -- that requirement that we were just looking at. And the requirement there is that when the memory has been switched in the claim language to the second regulated supply, the

functional circuit needs to be continuing to use or be provided a regulated first voltage.

BY MR. LEE:

Q. And why do you conclude that that requirement is not met?

A. Well, I've looked at the operation of the products and, you know, looked at all the specifications that I mentioned, and I, you know, have determined that VCCR, you know, is not regulated in this time period.

We're moving into a deep sleep state, the entire goal of which is to turn off VCCR and put that component to sleep, and that's -- that goes against the other language.

Q. How, if at all, does that conclusion apply to the other asserted claims?

A. Well, it's consistent. So this same reason would apply to all the asserted claims.

MR. LEE: Could I have DDX-7.33 on the screen?

BY MR. LEE:

Q. And using DDX-7.33, can you illustrate why for this third reason, Intel doesn't infringe the claims?

A. Sure. So this is just showing you again the -- what the patent spells out and then what the products do. And we'll see how they compare.

So the '373 patent in the scenario, the second scenario we've been talking about where the first regulated voltage in

green is low, it's lower than the minimum operating voltage of the memory. The power supply selector there in white selects the second regulated voltage to be given to the memory so the memory can hold its data or do whatever it needs to do.

Meanwhile the claim language says: At the same time while the functional circuit is continuing to be provided or continues to use the first regulated voltage. That's the '373 invention.

Q. Now let's turn to DDX-7.34. What is shown on DDX-7.34?

A. So this is the actual product operation when those products are in Package C7 or deeper sleep states. And the C6 SRAM is kept alive as its backup memory, right? And it's being provided VCCIO, okay? But the rest of the ring domain, it's the gray region kind of below some of that X there, is powered down. It's off. It's not doing anything. It can't do anything because the VCCR, the voltage, has been turned off. It's floating, it's not regulated.

MR. LEE: Could I have DDX-7.35 which puts these two together?

BY MR. LEE:

Q. All right. And what does that tell us about the difference between the manner in which the Intel product operates and the manner in which the '373 patent operates?

A. It just shows you they're not consistent, so the

claims related to this part of the operation are not met.

Q. How did you determine how the C6 SRAM specifically operates?

A. Again, looking at specification documents, reading engineer depositions about -- that were involved in the design of the different components, you know, largely those things.

MR. LEE: Could I have D-27 on the screen, please?

BY MR. LEE:

Q. Do you recognize this?

A. Yes, I do.

Q. Is it one of the documents you reviewed?

A. It is.

Q. What is it?

A. So this is called a mass microarchitectural specification of the last-level cache, which is that big component inside the ring. Actually the C6 SRAM is also described in this document.

Q. If we move to Page 39 at the bottom to the top of Page 40, do you see the section entitled "Power Supply Mux"?

A. Yes.

Q. All right. How does this document in this portion of the document relate to the C6 SRAM operation you've just described?

A. Well, this specific section, 4.7, is describing the operation of that power supply mux component, which is part of

03:08 the C6 SRAM. So it's just describing, you know, how that
03:08 functions.
03:08 Q. Now I'm going to highlight the last sentence of the
03:08 first full paragraph. "When VCCR is powered down, the mux will
03:08 switch the bit cells over to VCCIO supply which never powers
03:08 down."
03:08 Have I read that correctly?
03:08 A. Yes.
03:08 Q. Now, what does that tell you about how the C6 SRAM
03:08 operates?
03:08 A. Well, I mean, it tells us that the idea here, you
03:08 know, when we're using the power supply mux and switching it is
03:08 we're going to turn off the VCCR, we're powering it down. Any
03:08 circuit connected to it isn't going to be able to do anything.
03:08 It's not provided a stable voltage. And we're moving -- we're
03:08 moving the memory over to VCCIO to make sure that it sort of
03:08 retains state. That's the idea.
03:08 Q. Now, do you and Dr. Conte agree or disagree that VCCR
03:09 is a regulated voltage when the chip is in the Package C7
03:09 state?
03:09 A. I believe we disagree.
03:09 Q. And to be clear, the claim that will be before the
03:09 jurors refers to a regulated voltage, correct?
03:09 A. Yes.
03:09 Q. Not just to any voltage?

A. That's right.
Q. Why do you disagree?
A. Well, based on documents like this and other schematics and things and my own experience designing voltage regulators, you know, if you turn off a regulator and you have a floating output, that's the opposite of regulation.
Regulation's supposed be stable, reliable. You can count on it to be a value that you can use.
If you let it float, it can move all over the place, so that's definitely not regulated.
Q. In all your years in the field, have you ever heard any of your colleagues or persons of skill in the art refer to the output of a voltage regulator that has stopped regulating as a regulated voltage?
A. No.
Q. Now let's focus on the time frame when the VCCR is turning off. Dr. Conte referred to that as the ramp, correct?
A. Okay. Yep.
Q. Hold on.
And let me ask you this: How long does that transition take?
A. Takes about a half a microsecond.
Q. How long is a microsecond?
A. A microsecond is one one-millionth of a second.
Q. Why does a VCCR simply not turn off immediately?

03:10 A. Why does the voltage --
03:10 Q. Yes.
03:10 A. -- not go to zero immediately, or why does it --
03:10 Q. Why does it not go to zero immediately?
03:10 A. Well, voltages have to transition. This is physics. So we can't move from one volt to zero volts instantaneously. That's just against the fundamental laws of physics.
03:11 So it has to be -- it has to go down either gradually or rapidly. It doesn't matter, but it has to transition downward and -- yeah. So that's the reason it doesn't happen instantaneously.
03:11 Q. Is the voltage regulated or not regulated during that transition period?
03:11 A. It's not regulated because it's rapidly transitioning. It's moving. You're trying to get to zero, and as you're moving through things, that's not stable. That's not regulated.
03:11 Q. Now, if I bring up DDX-7.36, do Intel's products infringe during this half a microsecond when VCCR is transitioning off?
03:11 A. No. They don't.
03:11 Q. Is there an everyday analogy you could give to the jurors that might help explain why a fast microsecond ramp-down period is not a regulated voltage?
03:11 A. I would think something like if you're driving in

your car and you've driving at 60 miles an hour and a deer runs in front of you and you want to slam on your brakes, your goal is to get to zero as quickly as possible.

You pass through every mile per hour in between, right? At some point in that really split second, you're going 30 miles an hour, but you wouldn't say that you were reliably or stably driving 30 miles an hour obviously. You're just trying to stop as quickly as possible from 60 to zero, so that's a way of thinking about it.

MR. LEE: Could we have DDX-7.37 on the screen, please?

BY MR. LEE:

Q. Do you see Claim 9?

A. Yes, I do.

Q. And do you see the underlined words, "While the circuit uses the first regulated voltage"?

A. Yes.

Q. And what conclusion have you reached about whether the Intel products satisfy this limitation of Claim 9?

A. Well, so we've already talked about the regulation being missing, right? So it's not a regulated voltage in this scenario.

But the Claim 9 also employs the word "uses," implying that the circuit is operating from this regulated voltage, and as we know, you know, the circuit's turned off, the clocks aren't running, there's no activity. It's being -- it's

asleep. It's not doing anything.

Q. Now, what happens to the clock in connection with transitioning to the Package C7 sleep mode?

A. Those clocks are turned off in the ring.

Q. And what does that mean about whether the claim is satisfied?

A. Well, again, you know, the clock's not toggling. You're not going to be doing anything, so it's hard to say you're using something if you can't actually do anything. Just turning it off.

Q. All right. Now, let me move to a different topic.

You heard Dr. Conte and Dr. Annavaram testify about their testing and analysis of the C6 SRAM feature?

A. Yes, sir.

Q. And they testified about the power savings supposedly attributable to the C6 SRAM power mux, correct?

A. Yes. I heard that.

Q. Before I ask you for your opinion on them, could you just remind us how they came up with those estimates and maybe we can start with PDX-7.38.

A. Yeah, so I'll just be brief here because I know the jury has heard a little bit about this model already.

But Dr. Annavaram was asked to create an alternative design to what was in the accused products to try to evaluate the value of that feature, and in doing so, he used the Intel

Power Model, which is a spreadsheet as we show here or a set of spreadsheets, and he modified those and chose a bunch of inputs to try to come up with his result.

MR. LEE: Could I have DDX-7.39 on the screen?

BY MR. LEE:

Q. Can you briefly remind us of the inputs to the Power Model?

A. Yeah. So the first four rows are really the main ones that I believe he looked at.

So project, and then SKU, collectively kind of choose like the characteristics of the product. Like in this case, it's a mobile Haswell, if you look at Line 2, part with two cores, two graphics engines and 15 watts as the peak power.

Q. So just so we know we can judge the testing that was done, how many different combinations of these inputs are there in the Intel Power Model?

A. Well, if you take residency and workload as well as the first two, is that what you're asking?

Q. Yes.

A. Yeah. So if you take all four of those, I think it would probably be in the 1000-plus range.

MR. LEE: Now, if I could have DDX-7.40.

BY MR. LEE:

Q. How did Dr. Annavaram go about making his computations or his calculations?

03:16 A. Okay. So what he did was, as I mentioned, Dr. Conte had asked him to evaluate an alternative design and gave him some directions on what that should look like.

And then to do that, he had to modify the Power Model. So he had sort of a baseline and then he had his other one, and then he compared those. So that's -- that was what he did there.

And then he also had to select the inputs. Now, I talked a little bit about the SKU, which is the product kind of thing. I didn't talk too much about the residency and workload, but those I will talk about more. Those are what the computer's basically doing, you know. Is it playing a game or is it using Microsoft Word or whatever?

Q. And how did Dr. Annavaram modify the Power Model?

A. So he was told to assume that the components in the rest of the ring domain -- so everything outside of the C6 SRAM in the ring, so LLC, CBO, everything else like that -- had to remain powered.

So basically they had to remain at some voltage level that was enough to retain state, as opposed to being powered down. So that all that power that was saved in the products he's attributing now to that.

Q. And how did Dr. Annavaram select his inputs for his Power Model?

A. So he selected one Haswell product and one Broadwell

product to run through the spreadsheet, and he did that based on sales volume.

Q. Then what did he do?

A. And then the Lines 3 and 4 in the inputs which we didn't talk too much about, residency and workload, he did some of his own testing on some computers using some benchmark programs.

And then he evaluated how much time his computers were spending in different states, like Package C7 or whatever. And then he mapped that to the most, you know -- to a value inside the spreadsheet.

Q. Now, you agree with the power savings estimates that Dr. Conte and Dr. Annavaram generated with these calculations?

A. No, I don't.

MR. LEE: Could I have DDX-7.41?

BY MR. LEE:

Q. Using DDX-7.41, can you explain the problem with Dr. Annavaram's analysis of the alternative design?

A. Yeah, sure. So the left side here shows sort of the actual product operation, a little bit like what was on the magnet board, right? There's that switch that goes between the two voltages. There's the two voltage supplies, VCCIO and VCCR.

And, you know, we've grayed out regions here, because when the chip is actually in the Package C7 state, remember the

other circuitry is powered down. It's consuming basically no power. The VCCR is turned off. That's why it's gray, okay?

Now, on the right side, the proposed alternative by VLSI actually said, well, we're going to throw away the power supply mux and we're going to throw away the VCCIO, and we're left with just the VCCR. And since we have to keep the C6 SRAM alive, we have to keep everything in the ring alive. And that's what they assumed.

Q. And that is the only alternative that Dr. Annavaram considered, correct?

A. Yeah, that's right.

Q. Were there other alternatives for him to consider?

A. Yes, there were.

MR. LEE: Could I have DDX-7.42 on the screen?

BY MR. LEE:

Q. And did these other alternatives actually come from older generations of products?

A. Yes, they did.

Q. Could you explain to us what other alternatives there were that Dr. Annavaram didn't even consider?

A. Yes. So there's two that I focus on here, right? So the far left is so-called Penryn processors. These predated the accused products by several product generations, and they were being designed in the 2004/2005 time frame.

And the way those worked is they had a C6 SRAM as well.

So Intel was already using C6 SRAMs. And what they did was they had two supply voltages, okay? So that's not any different in some ways than the accused products. But they powered the C6 SRAM on the VCCIO, or the second voltage, all the time, just to keep it safe, right?

And then when they wanted to go to these deep-sleep states, they would just turn off voltage 1, turn off the rest of that domain, and they would get a lot of power savings from that, okay?

And then the next generation of processors was called Nehalem. They also included a C6 SRAM.

The engineers decided to do it a little bit differently that time. They only used one voltage, okay? But they used this switch. It's not the same as the power supply mux but it's very similar. It's a power gate and it can turn on or off. Very simple, right?

So what happens is that usually that's on and this entire domain is operating like normal.

When you move into the deep-sleep states that we're concerned with here, you turn that off. But that only controls the power going to the rest of the domain, the gray region here.

So I can locally turn that power off while retaining the power voltage 1 applied to C6 SRAM and retaining that data. That was another known design that had shipped millions of

times in product.

So both of these were designs that Intel already knew how to do that would achieve the same function, you know, basically as the accused products.

MR. LEE: And if we could have DDX-7.43.

BY MR. LEE:

Q. On the left-hand side is what?

A. That's the Haswell and Broadwell designs of the C6 SRAM.

Q. On the right-hand side in the top portion is what?

A. Those are previous Intel products that also use the C6 SRAM.

Q. And the lower right-hand corner is what?

A. That's the design alternative that they came up with to try to estimate the power savings of the C6 SRAM power mux.

Q. And by not failing to consider the options used in prior Intel products on the top half of the slide, what was the effect on the power savings conclusions that Dr. Annavaram and Dr. Conte reached?

A. I think you might have said "not failing to consider," so if you want to restate --

Q. Yes, let me restate it.

Dr. Annavaram did not consider the alternatives in the top right-hand portion of the slide, correct?

A. That's true.

Q. By not considering them, what was the effect on his computations and his conclusions?

A. Well, the green region at the bottom right, the other circuitry, is big. It leaks a lot. And by keeping that awake and alive, the power savings was overestimated significantly compared to the top designs which Intel already knew how to do, because there the green region is completely powered down or asleep.

MR. LEE: And let me have DDX-7.44, please.

BY MR. LEE:

Q. You mentioned the SKUs. Would you remind us how Dr. Annavaram selected his SKUs?

A. Yes. So he was given information on the highest sales volume by SKU, by part, by specific chip that was sold. And then he tried to map that to the set of input SKUs that were there. And he found the closest fit that he could find.

Q. Now, Dr. Annavaram testified yesterday that his test results were applicable across all the versions of the different products of Haswell and Broadwell. Do you remember that?

A. I do.

Q. Do you agree?

A. No.

Q. Why not?

A. Well, the characteristics of the products differs,

right? They've got different size memories, different numbers of cores, the total power budget of each chip is different by a factor of five or six across the product family.

It's a very broad product family, so picking one particular chip out of dozens or even more and saying that represents the value of the feature for everything is over-simplified.

Q. And have you identified an everyday example that would explain that to the jurors?

A. Yeah, I have. It's on the next slide, I think.

MR. LEE: Could I have DDX-7.45 on the screen?

BY THE WITNESS:

A. I wish I could say this is the last car example, but we might have one more. So sorry.

But this is showing you for Ford vehicle sales, Ford has a lot of products too in a given year. And the characteristics of these products varies. You can see here you've got trucks, you've got hybrid vehicles, right?

And, you know, the sales vary as well. The best selling is the truck, F-150 series -- of F series, excuse me. But the value of a feature on, say, fuel economy for that truck is not necessarily the same -- doesn't have the same value if you apply that same feature to the hybrid vehicle, for instance, right? So this is a similar way of looking at it.

BY MR. LEE:

03:25 Q. And what does -- what effect does Dr. Annavaram's selection of one SKU family to represent power savings for many have on his results?

03:25 A. Well, it means to me it's unreliable. I don't -- I don't know what it's going to impact, but it means that you just can't make that simplification.

03:25 MR. LEE: Could I have DDX-7.47 on the screen? And let's turn to the third bullet point.

03:25 BY MR. LEE:

03:25 Q. Remind us what residency and workload inputs are.

03:25 A. Yeah. So residency is -- you can think of it as how often the chip resides in these different operating states. Package C7 is the one we're talking mostly about, but there's C3, there's C6. There's C0 where it's crunching numbers and doing its work. It's active.

03:25 How much percentage-wise does it spend in every one of those states? Workload is sort of, you know, what kind of programs are -- it's running and things like that.

03:25 Q. Now, Dr. Annavaram testified yesterday that he used the Core C7 data from his MobileMark testing rather than the Package C7 data. Did you hear that?

03:26 A. Yeah, I did.

03:26 Q. Do you have any concerns with that decision?

03:26 A. Well, yeah. That was a mistake, right? So he should have used the Package C7 data that he collected because that's

where the C6 mux switches. It does not switch as part of the Core C7 state.

Q. And is there a difference in the data for those two categories?

A. There is.

MR. LEE: Could I have DDX-7.47, please?

BY MR. LEE:

Q. What was the number for the Core C7 state?

A. Well, the Core C7 state is entered more often. It's a lower sleep state. So in his example he's seeing it almost 76 percent of the time it was in the Core C7 state.

Q. And for the Package C7 state?

A. In the Package C7 state, there's a couple different Broadwell parts here, but the one that I've highlighted here is 41 percent of the time it's in the Package C7 state.

Q. And what's the effect on the conclusions and numbers that he comes up with at the end of the day?

A. Well, basically the time spent in Package C7 goes straight to their number of power savings. So if you overestimate that value, in this case by nearly a factor of two, it's going to directly translate to an overestimate in your power savings estimate by the same ratio.

Q. Well, let's go to one other portion of the analysis on damages that Dr. Conte did.

Did you hear him testify that power and performance have a

one-to-one relationship?

A. Yes.

Q. That performance and frequency have a one-to-one relationship?

A. Yes.

Q. And that power and frequency have a one-to-one relationship?

A. Yes.

Q. Is he correct?

A. No.

Q. Let's start with the assumption that performance and frequency have a one-to-one relationship. Why is that not correct?

A. Well, that's because your computing system that these chips go in have a lot of other components. And the performance is a function of all those different components. Any one of many components can be limiting to the performance as perceived by the user.

So it's not just the processor frequency. If you increase the processor frequency, it doesn't always mean that the performance actually increases.

Q. Can you give us an example to illustrate that?

A. Yeah. So, you know, one of the other components in the computing system often is not the memory as we've been talking about but another piece of memory you put in your

computer board, motherboard, called DRAM.

And you might be running a job that requires you to grab a lot of data constantly to the processor from the DRAM, okay? And if your DRAM is too small or if your DRAM's really slow, then that -- then you're going to be sitting there waiting for the processor to keep grabbing data from the memory.

And so in that case the DRAM is actually the bottleneck. And increased processor frequency is not going to really help your performance, because it's going to be waiting a lot.

Q. Let me ask you about the assumption that a 1 percent power savings will be used to increase performance by 1 percent. Do you recall him saying that?

A. Yes. I do.

Q. Do you agree?

A. No. I don't.

MR. LEE: Let's have -- bring up DDX-7.48.

BY MR. LEE:

Q. Using DDX-7.48, would you explain why Dr. Conte's equation of -- or Dr. Conte's conclusion that there's a one-to-one relationship between power savings and frequency is incorrect?

A. Yeah. So the power and frequency, you know, do have a relationship, right? So Dr. Conte's assuming that if you save 1 percent power, that can be translated directly to a 1 percent increase in base and turbo frequencies of a

processor.

So if you click once, you'll see that, you know, for -- the arrows here are identically sized, right? For one unit of power saved, you can get one unit or roughly equivalent percentage-wise increase in frequency. But we've seen with these voltage frequency curves that I showed, and I believe Mr. Douglas also showed, that the chips actually use, the way that they -- the way that we increase frequency in these chips is we turn up voltage, okay, because that makes the transistors faster and the chip faster.

And there is a relationship between power and frequency, but it also includes voltage. So, you know, the right-hand side shows power actually goes or is proportional to voltage squared, so voltage times voltage. So it's actually a stronger variable, has a stronger impact, and then frequency.

So what does this mean? It means that if I get it some power savings, like the arrow, so if we click, I can translate this into frequency gain, but I do it by increasing voltage. And that's going to actually take up most of my savings, just turning up the voltage.

It's not a good trade-off, but it's what's used to increase frequency. So you're going to get a lot smaller than one-to-one frequency gain there.

Q. So let me bring you specifically to Dr. Conte's contentions that the memory that the jury should find infringes

the claims is the C6 SRAM.

A. Yeah.

Q. Do you have that in mind?

A. Yes.

Q. Does Dr. Conte's assumption that power savings can be capitalized as increased frequency make sense when you're talking about the C6 SRAM?

A. Yeah. It doesn't for another reason.

So beyond, you know, this more technical argument here, you know, the C6 SRAM is put into use or used in the deep-sleep state. So it's saving power in these very, very deep-sleep states.

Now, the performance in active mode, turbo frequency, for instance, that's limited by other things, okay?

So a good analogy here is, last car one, is a car analogy. So a lot of modern cars. You pull up to a stoplight, your car will automatically shut off for you to try to save fuel. And then as soon as you start to move to the gas pedal, it'll quickly start back up again and go on.

The idea being that, you know, you don't need to use it then, so you might as well shut it off, right? Sounds familiar.

Now, that feature may save gas, but that feature will not make the top speed of your car any higher. That's the frequency, right? That's the turbo frequency, for instance.

They have no relationship there.

So that's an analogy here. And so we can't take these sleep mode savings and translate them to turbo frequency or base frequency increase.

Q. Thank you, Professor Sylvester.

MR. LEE: Your Honor, that completes the direct examination.

THE COURT: Ladies and gentlemen of the jury, we're going to take a ten-minute recess. And might be a minute or two longer than that, but we'll take a recess now. Remembering my instructions not to discuss the case amongst yourselves.

Doctor, you can step down as well.

(Jury exited the courtroom at 3:33.)

THE COURT: Thank you. You may be seated.

What witness will come on after this gentleman?

MR. LEE: After the cross is completed and whatever follows, Dr. Rotem will testify next, then Mr. --

THE COURT: How long do you anticipate the next witness taking?

MR. MUELLER: I'd say, Your Honor, on direct, probably about 45 minutes to an hour.

THE COURT: Is there any way you would have a -- I mean, we can go till 6:00. I'm happy to do that, but I don't want to stay too much past that, and I don't want to break -- do you have a depo or something we could -- well, let's see.

03:33 We've got -- I suspect this gentleman will not be done before 4:30. Do you think we can get the next one -- do you want to try doing the next witness?

MR. LEE: I think that'd be great.

THE COURT: Okay. Let's do that.

MR. LEE: Okay.

THE COURT: Mr. Chu, is that okay with you?

MR. CHU: It's okay. I may go an hour and a half, hour and three-quarters.

THE COURT: That's -- we'll just have to do it.

MR. CHU: All right.

THE COURT: And if we can't -- you may go with the next witness or with this witness?

MR. CHU: No, with this witness on cross-examination.

THE COURT: You may go longer than I anticipated? You go as long as you want. Why don't we just wait and see where we're at when you finish, and if Intel could find something they could do, if we get to like 5:15 that you could do for, you know, some small amount of time just to use up another half-hour, that'd be great.

MR. LEE: Okay. That's what we can do.

THE COURT: Because I don't want -- or we can call your next -- we can do that and we can call your next witness and just have him -- it's a him, correct?

MR. LEE: Yeah. Dr. Rotem.

THE COURT: Okay. We can just have that person get qualified up and then we'll be done. But I'd like to go till 5:30 or 5:45, if we can.

MR. LEE: He's just a fact witness, Your Honor. But we can put his background on for sure. Okay.

THE COURT: Mr. Chu, you have no time limit on how much time you have with this gentleman at all. If we go through the end -- if we go till 6 o'clock with this gentleman, I'm sure nothing will make him happier. He's having a great time up there.

(Laughter.)

THE COURT: And so are we. And so whatever you want to do, I'm just trying to maximize our use of time, and I don't want to get someone unfairly started like, as you know, is my practice. So I've already used up five of your minutes. Let's -- we'll come back in ten minutes from now.

(Recess taken from 3:35 to 3:52.)

THE COURT: Please stand for the jury.

(The jury entered the courtroom at 3:52.)

THE COURT: Thank you. You may be seated.

MR. CHU: Thank you very much, Your Honor.

Good afternoon, ladies and gentlemen of the jury. Is it okay if I wear my little parka before I freeze to death?

Thank you very much.

CROSS-EXAMINATION

BY MR. CHU:

Q. Good afternoon, Professor Sylvester.

A. Good afternoon. Nice to meet you.

Q. Nice to meet you as well.

You had three reasons where you're contending that Intel does not infringe, correct?

A. That's correct.

Q. And the first two of those reasons had to do with the minimum operating voltage, correct?

A. Yes. They dealt with that. Yes.

Q. And during the course of your direct testimony you described the RING_RETENTION_VOLTAGE; is that correct?

A. I talked about that. Yeah.

Q. So what is the CLR?

A. CLR is another name for the ring domain. CBO/LLC ring, that's what it stands for.

Q. So if I also refer to CLR or CBO, that would be all part of the ring domain?

A. I would say CLR is equivalent to the ring domain and the CBO is a component inside of those domains.

Q. Very good. And would you consider the C6 SRAM to be a component as part of the ring domain?

A. Yes.

Q. And from your interaction with Intel engineers, would you say that they understand the concept of voltage minimum or

Vminimum?

A. Vmin is a term they use --

Q. Sir --

A. Sorry.

Q. -- would you say with your interaction with Intel engineers that they understand the concept of voltage minimum? Is that correct?

A. That's not a term that I --

Q. So it's not correct?

A. I wouldn't use that exact term. That's what I was trying to clarify.

Q. I wasn't asking about the term you would use. Did you have an understanding that Intel engineers would refer to voltage minimum? Is that correct?

A. Vmin is a term Intel uses. Yes.

Q. And you understand when they use the term "Vmin," they're referring to the voltage minimum, correct?

Can you answer that fairly yes or no?

A. It's a minimum voltage.

Q. Sir, can you fairly answer that yes or no?

A. Sorry. Can you repeat the question?

Q. When Intel engineers use the phrase "Vmin," that refers to voltage minimum, correct?

A. Yes.

Q. Now, you were asked by Intel's counsel the following

03:56 question and answer -- and I take notes a lot in my bound trial
03:56 notebook, and I try to take very careful, copious notes, and
03:57 here's what I took down, and I'm going to ask you whether I got
03:57 the question and answer accurately:
03:57 "Question: Did you find anything in Intel documents on
03:57 minimum operating voltage for C6 SRAM?
03:57 "Answer: No. I did not."
03:57 Does that comport with your memory of your testimony?
03:57 A. Minimum operating voltage of the C6 SRAM, is that
03:57 what you said?
03:57 Q. That's correct. Is this consistent with what you
03:57 testified to?
03:57 A. Yeah.
03:57 Q. Thank you.
03:57 MR. CHU: Now, I would like to call up PTX-3675. And in
03:57 particular, I'll use the last three digits of the page, 353.
03:58 Let's blow up the second row that has the C6 SRAM. Can
03:58 you blow that up?
03:58 MR. LEE: Your Honor, should it be off the public screen?
03:58 THE COURT: I don't think there's anyone in the
03:58 courtroom --
03:58 MR. LEE: Okay.
03:58 THE COURT: -- that is -- that can see them. I'm going to
03:58 say that on the record. I don't believe there's anyone in the
03:58 courtroom who isn't allowed to see them.

MR. CHU: Can we blow up that second row, C6 SRAM?

BY MR. CHU:

Q. So you see this is relating to the C6 SRAM. Do you see that?

A. Yeah. I see that.

Q. Okay.

MR. CHU: Let's blow up the first four rows, including the headers to the columns above it.

BY MR. CHU:

Q. So on this PTX-3675, an Intel document for the Haswell 1270 Array, on the right-hand side, you see that the Intel engineers recorded information for Vmin; is that correct?

A. Vmin. That's what it --

Q. Is that correct?

A. Yeah. Vmin it says.

Q. And they recorded it for different components of the ring, correct?

A. Yes.

Q. And one of the components we spent a lot of time is the C6 SRAM, correct?

A. Yes.

Q. And the Vmin for C6 SRAM was 0.75, correct?

A. That's what this document says.

Q. And another part of the ring is the LLC data, correct?

A. Yes.

Q. And the Vmin for that is exactly the same, 0.75, correct?

A. That's what the document says. Yes.

Q. And then another component is LLC Tag/Stat, and the Vmin for that is also exactly the same, correct?

A. Yes.

Q. And the fourth component and last component on this document for the CLR CBO is the LLC CV/LRU, also part of the ring, and its Vminimum is exactly the same, 0.75, correct?

A. Yep. That's what it says.

Q. So the Intel engineers understand the concept of voltage minimum and they were able to measure the voltage minimum for each of these components separately; is that correct?

A. I don't know if this is a measurement or simulation, but it's possible.

Q. Now, I'll go back to your trial testimony this afternoon. What I wrote down was: Question: "Did you find anything in the Intel documents on minimum operating voltage for C6 SRAM?"

Answer: "No. I did not."

Is that - that was your testimony, correct?

A. Yes, that's correct.

Q. Thank you.

Now, what we were just looking at was for the Haswell chip. Let's go to PTX-3675, and the last three digits of the page are 353, and let's blow up the same material, and you see this is for the Broadwell 1272 chip, correct?

A. Yes.

Q. And you see the Vmin is exactly 0.75 for each and every component of the ring, correct?

A. Yes. That's the Vmin, yes.

Q. Thank you.

Now, earlier this afternoon when you were testifying about the RING_RETENTION_VOLTAGE, you had created a chart to show three voltage points; is that correct?

A. Yeah, VF curve, yes.

Q. One of those was V0, correct?

A. Yeah.

Q. And one was V1, correct?

A. Yes.

Q. And one was V2, correct?

A. That's right.

Q. And you were trying to make the point that V0 could be below the RING_RETENTION_VOLTAGE, correct?

A. It is below. Yes.

MR. CHU: And let's call up the Intel chart -- I think it is DDX-7.21.

BY MR. CHU:

Q. This was the chart that you created?
A. Yes. That's right.
Q. And you knew that Jonathan Douglas, the Intel engineer who was testifying before you, was going to create in a handwritten fashion, or his counsel's -- in his counsel's handwriting essentially the same chart, correct?
A. I'm not sure I knew that actually.
Q. You saw when Mr. Douglas took the stand that he created by his testimony a chart that is almost exactly the same as the chart that you used, correct?
A. Yes. I did see that this morning.
Q. Both Mr. Douglas' chart and your chart were created for the purposes of this litigation only; is that correct?
A. I hadn't created this before the litigation. No. So, yes, that's correct.
Q. Well, this chart did not come out of Intel's engineering files, correct?
A. It came from the data I looked at.
Q. Sir, this chart did not come from Intel's engineering files; is that correct?
A. You could say that. Yes.
Q. And it's a chart that you created for the purposes of illustrating your testimony, correct?
A. Yes, sir.
Q. You've seen Intel engineering documents that relate

to this subject matter in general, correct?

A. Yes.

Q. Let me show you one as an example, D-505, and page -- you see this is a document about Haswell and the FIVR, the fully integrated voltage regulator; is that correct?

A. Yes.

Q. And let's go to Page 24. And let's blow up the two charts in this Intel engineering document that the engineers had created not for the purposes of this litigation.

Do you see the chart on the left-hand side has a number of voltage points?

A. Yes.

Q. And do you see beneath the curve is V retention? Do you see that?

A. I do. Yes.

Q. And it would be fair to consider V retention as voltage retention, correct? Yes or no? Can you answer that for me?

A. Yeah, V stands for voltage, yes, voltage.

MR. LEE: Your Honor, could we have this taken off the public monitor?

MR. CHU: Sure.

THE COURT: Yes. Is there -- yes. Definitely. Of course.

MR. CHU: I thought it was.

BY MR. CHU:

Q. And on the chart on the left, every single one of the points is above the V retention, correct?

A. That's correct.

Q. And the same is true on the chart on the right. Every one of the V points is above the V retention, correct?

A. That's right.

MR. CHU: Let's call up a slide which is PDX-4.2.

BY MR. CHU:

Q. Well, let's do this. We're going to go back to your slide, and let me see if Mr. Simmons can put -- okay. Very good. We have PDX-4.30.

You see on the left-hand side we have reproduced the chart you created for the sole purposes of the litigation; is that correct?

A. Based on the analysis in the litigation --

Q. Sir, can you answer fairly the question yes or no? You can also say you can't answer it.

We put on the left-hand side the chart you created solely for the purposes of litigation, correct?

A. Yes.

Q. Thank you.

And we put on the right a document created by Intel engineers without an eye to this litigation; is that correct?

A. I can assume that's the case, yes.

Q. And the chart on the right that came from the Intel engineering documents, is this -- this is a chart that you've seen before from the Intel engineering documents; is that correct?

A. Yes, I've seen it.

Q. And indeed the chart on the right, you actually put into your expert report that you had to submit in connection with this case; is that correct?

A. The one on the right, you said?

Q. Yes.

A. Yeah, possibly. I can't recall exactly.

Q. Well --

A. It could be.

Q. -- will you take my representation that it is in your report and that you reproduced the chart, but when it came down to illustrating the technical points to the jury, you chose to draw up a brand new chart, the one on the left, instead of using the chart created by Intel engineers in the ordinary course on the right; is that correct?

A. Yes. For good --

Q. Thank you.

A. Yes.

Q. Going to go to a new subject.

You discussed Professor Annavaram's testimony; is that correct?

A. Yes, sir.
Q. And you criticized Professor Annavaram on a number of grounds, correct?
A. I did.
Q. And you know that Dr. Annavaram used certain workloads, correct?
A. Yes.
Q. And the workloads are what a person with a computer might do. They might have a word processing program. They might have an Excel spreadsheet. They might do PDFs from Adobe. That's what a workload consists of, correct?
A. That's right.
Q. And you basically said he -- his choice of the workloads was wrong. You were criticizing him for that, correct?
A. That's not exactly right.
Q. Your view was that the workloads chosen by Dr. Annavaram are not representative; is that correct?
A. No.
Q. You had criticisms of the workloads used by Dr. Annavaram, correct? Yes or no.
A. I criticized the residencies.
Q. The residency also incorporated workloads, correct?
A. Well, they're two separate --
Q. Sir, if you can fairly answer yes or no --

A. Okay.
Q. -- that would be helpful.
A. The residency incorporated workload, is that what you said?
Q. Well, let's back up.
A. Okay.
THE COURT: Let me -- just a second.
MR. CHU: Let me slow down.
THE COURT: No, no. You could slow down. That would be good. But I want to make sure -- are you all able to hear this gentlemen because I'm having a hard time. Is it just me? Are you able to hear him? Okay.
(Off-the-record discussion.)
THE COURT: Mr. Chu, I'm sorry, but I wanted to make sure.
MR. CHU: That's quite all right, Your Honor.
BY MR. CHU:
Q. And if you need, Professor, to change your position to adjust the microphone -- I assume someone, either members of the jury or His Honor, will help us out here because we want everyone to hear your testimony.
Despite your criticisms on this subject of Dr. Annavaram, you yourself did not propose different workloads, correct?
A. That's correct.
Q. You yourself did not propose a different set of workloads, correct?

A. That's correct.

Q. And you have the technical ability to choose whatever you would think would be a more representative set of workloads; is that correct? Yes or no.

A. I could probably do that.

Q. Yes. So you criticized, but you didn't take the risk of proposing an alternative set of workloads, correct? Is that correct?

A. That's correct.

Q. You also criticized Dr. Annavaram in the particular Intel chips he chose to examine; is that correct?

A. I did.

Q. You know he chose two Haswell chips, correct?

A. Actually, I can't remember if it's one or two.

Q. I'll represent to you in your report you describe Dr. Annavaram choosing two Haswell chips and two Broadwell chips; is that correct?

A. I think initially, yes.

Q. And SKU is an abbreviation for a stocking unit. Grocery stores use this. If it's Campbell's mushroom soup of a particular size, that's one stocking unit. Campbell's chicken noodle is a different stocking unit; is that correct?

A. That's right.

Q. And even high-tech companies like Intel use something similar. They could have a number of Haswell chips, but they

might be one SKU and a second SKU, correct?

A. That's correct.

Q. Despite your criticism of Dr. Annavaram about his set of SKUs that were Haswell and Broadwell chips, you yourself did not identify a more representative set of Intel SKUs, correct?

A. No. I did not.

Q. Again, you would have the technical ability to do that, correct?

A. I don't know if I can answer that yes or no.

Q. Well, let me ask this: You're not sure whether you have the technical ability to do that, but you made clear that you were being critical of Dr. Annavaram's choice; is that correct? You were clear in criticizing Dr. Annavaram, correct?

A. Yeah, I was clear, yes.

Q. And in your work if you wanted some Intel engineers to help you out, you would expect that Intel would be fully cooperative with you, correct?

A. I think so.

Q. And you believed that either by yourself or with the help of Intel engineers, you could have identified a more representative set of Intel chips or SKUs, correct?

A. If that was part of my task, yes.

Q. Could you answer my question fairly yes or no? Sir, do you have the question in mind? I'm happy to repeat it.

A. I think so. Yeah, I think I have it in mind. I

would say yes.

Q. Thank you.

You're familiar with a Mr. Gunther who's an Intel engineer, correct?

A. Yes, I am.

Q. And you spoke to Mr. Gunther about the Intel Power Model, correct?

A. Yes, I did.

Q. And you understand that Dr. Annavaram did work using the Intel Power Model, correct?

A. Yes.

Q. And it would be fair to say this is a model that Intel created for itself for its internal use wholly apart from the litigation, correct?

A. Correct.

Q. And it's a Power Model for the Intel engineers to analyze their chips, their chip designs and new chip designs on their power usage, correct?

A. Yes.

Q. And you specifically spoke to Mr. Gunther on at least two or more occasions about the Intel Power Model, correct?

A. Twice, yes.

Q. And this was in connection with your work criticizing Mr. Annavaram, correct?

A. Yes. That's true.

Q. And during your contact with Mr. Gunther, you did not ask him whether Intel has better models available for use, correct?

A. Correct.

Q. Mr. Gunther didn't say, because you're talking to him about Dr. Annavaram's use of the Intel Power Model, oh, boy, why is he doing that? We've got this super power model that's so much better. Mr. Gunther never said anything along those lines to you, correct? Let me rephrase it.

A. Yeah.

Q. Mr. Gunther never told you when you were working with him and criticizing Dr. Annavaram: Here is a better power model than the one Dr. Annavaram used?

A. I can't answer that, because the question --

Q. Sir, if you can't answer it yes or no, that's fine. Just say I can't answer it yes or no; is that right?

A. That's right.

Q. Okay, that's fair.

A. Okay.

Q. The fact is you were not aware of a better power model than the one that Professor Annavaram actually used in his work; is that correct?

A. That's correct.

Q. You did not also yourself try to create a new power model as a part of your analysis in this case; is that correct?

A. That's true.

Q. Part of your criticism of Dr. Annavaram was for you to suggest that his calculations and his power model might be off in a material way; is that correct?

A. Yeah. That's fair.

Q. But as you sit here today, you don't know whether Dr. Annavaram was off by one-tenth of 1 percent or 1 percent or some other number; is that correct?

Can you fairly answer that yes or no?

A. Yeah. I don't know the exact percentage. Is that what you're asking?

Q. Well, let me just read a portion of your deposition transcript. It's at Page 95, Line 12 through 25.

I'll read just a portion of this. See if it refreshes your recollection.

MR. LEE: Can he see it?

MR. CHU: Oh, yes. We have put for you a copy of your deposition transcript -- I hope it's not that big binder. It should be.

THE COURT: Mr. Chu, why don't you repeat for him the page?

THE WITNESS: I've got it.

THE COURT: Or you can put it up on the screen, either way.

MR. CHU: Okay. Well, let me just read it. It'll just be

quicker. It's Page 95 starting at Line 12.

THE WITNESS: Okay.

BY MR. CHU:

Q. Question: "And so you don't know, as you sit here today, whether according to your opinion Dr. Annavaram was off by .1 percent or 1 percent or some other number, correct?"

Answer: "Due to this specific topic, right."

That was a truthful answer, correct?

A. Yes. That's right.

Q. Thank you.

You do understand that Intel engineers for non-litigation purposes rely on their power model, the same one Dr. Annavaram used in his analysis, correct?

A. Yes.

Q. And they use it for a number of reasons, including to determine the amount of power consumption, correct?

A. Yes.

Q. And knowing that is useful for the Intel engineers, correct?

A. Yeah, it's a bit useful.

Q. And you have reviewed deposition transcripts where that is what the Intel engineers said, right?

A. Yes.

Q. And they also used the power model to reduce power consumption, correct? Can you fairly answer that yes or no?

A. Not directly, no. I would say no.

MR. CHU: Well, let's put up Steven Gunther's deposition. I think it's PDX-4.15 [sic].

BY MR. CHU:

Q. This is the Intel engineer you worked with in coming up with your criticisms, correct?

A. I wouldn't characterize it that way, so I'd say no.

Q. This is the Intel engineer you had communications with in connection with your work in this case, correct?

A. Yes. That's right.

Q. And you agree with his statement that they used the power model to reduce power consumption, correct?

A. That's not exactly what it says.

Q. One of the purposes of the power model is coming up with ideas to further reduce the power consumption of Intel chips, correct?

A. Yes. That I would agree with.

Q. And you're also aware of the fact that the Intel Power Model that Dr. Annavaram used took many thousands of man hours to create, correct?

A. Yes. That's right.

Q. And, in fact, despite your criticisms, you would agree that Dr. Annavaram could not have made the power model any more accurate; is that correct?

A. Yeah. I would agree he couldn't do anything.

Q. If you can fairly answer yes or no?
A. Yes.
Q. Thank you.
And you don't think that Dr. Annavaram could have improved the model, correct?
A. Correct.
Q. Part of your expert work in this case had to do with alternative power supply implementations; is that correct?
A. Yeah. I guess you could say that, yes.
Q. And the reason you were doing this was to try and make the point that there are alternatives to the claimed invention of the '373 patent, alternatives that you believed could not be subject to an infringement claim, correct?
A. Yeah. Yes. That's true.
MR. CHU: Okay. Now, let me call up PTX-983, and in particular Page 601. This is first on the cover page.
BY MR. CHU:
Q. You see it's a Broadwell and Haswell document about C6 SRAM circuits, correct?
A. Yes.
Q. Okay.
MR. CHU: Now, if we'll go to that particular page that ends in 601.
BY MR. CHU:
Q. I'll tell you that the page has a title "C6/C7 SRAM

circuit options."

A. Should I look at that in my binder? Or is it going to come up on the screen?

Q. I hope it's going to come up on the screen. It'll be much faster.

A. Okay. Got it.

Q. As a part of your work, you looked at the particular document, and in particular this part of that document entitled "C6/C7 SRAM Circuit Options," correct?

A. That's correct.

Q. No. 1 alternative that is a switch supply alternative is basically what Intel implemented, correct?

A. Yes. That's right.

Q. So this was Intel engineers trying to think about how they would make sure that the C6 or C7 SRAM would always be fed sufficient voltage so it would not lose any data, correct?

A. Yes. That's right.

Q. And they came up with No. 1, as well as Options 2 and 3, correct?

A. Yes.

Q. And when you examined this subject, you thought that Options 2 and 3 were, then and today, very viable alternative designs, correct?

A. Yes. I do.

Q. Now, both of them are single-supply options, correct?

A. No.
Q. Look at No. 2. It says HSW. That's Haswell, right?
A. Yes.
Q. C6 SRAM, FUB -- that's stands for functional unit block, correct -- on the single supply, correct?
A. That's what it says, yes.
Q. Okay. Look at No. 3. That also is a single-supply option, correct?
A. That one's a single-supply, yes.
Q. And both before this litigation and after this litigation, Intel did not implement Option No. 2, correct?
A. Are you talking about Haswell, or are you talking about any product?
Q. Haswell.
A. Correct.
Q. Same with Broadwell, correct?
A. Correct.
Q. And both before this litigation started and since this litigation started, the other option which you considered today to be a viable option, Option 3, was not implemented by Intel for Haswell or Broadwell, correct?
A. Yes.
Q. And you still consider Option 3 to be a very viable option, even though the Intel engineers on the document that they created said "Haswell" or "HSW rejected," correct?

04:33 A. Yes, that's correct.
04:33 Q. And the Intel engineers also pointed to another problem in red, "comprises the power grid," correct?
04:33 A. That's what it says, yes.
04:33 Q. But nevertheless, you stand by your opinion that both Option 2 and Option 3, today, last year, year before that were viable options to the number one option that was selected for Haswell and Broadwell, correct?
04:34 A. Yes.
04:34 Q. You would agree that the Intel engineers for the purposes of providing voltage to the C6 SRAM would try and choose the optimal, the best option, correct?
04:34 A. Ideal, yes.
04:34 Q. And they wouldn't want to move to a second-best option or a third-best option, correct?
04:34 A. Usually, yes.
04:34 Q. An Intel processor and the processors involved in this case, Haswell and Broadwell, they may make changes to C-states; is that correct?
04:35 A. C-states, yes.
04:35 Q. And C7 would be the C-state being completely asleep?
04:35 A. It's a deep-sleep state, yeah, very deep-sleep state.
04:35 Q. Okay. If processors could have REM sleep and dreams, good dreams or nightmares, that would be the state, correct?
04:35 A. Yeah.

Q. Okay. Now, these processor changes in C-states from deep sleep to being awake can occur hundreds of times a second, correct?

A. From deep sleep to awake, is that what you said?

Q. No.

A. Okay. Could you repeat? Sorry.

Q. Sure, of course. The Intel processors in this case can have Package C-state changes hundreds of times a second, correct?

A. Yes.

Q. Thank you.

You do understand that the Haswell and Broadwell chips, when there is a ramp-down in the voltage from what you this afternoon called voltage regulator No. 1 have a ramp-down at a specific rate; is that correct?

A. Yes.

Q. And that ramp-down is programmed by the Intel engineers, correct?

A. Yes.

Q. They could program it to ramp down more rapidly, correct?

Yes or no. Can you answer that yes or no?

A. I'm not sure that's the case. Yeah.

Q. Can they program it to ramp down more slowly? That's correct?

04:37 A. Yes.
04:37 Q. And you're familiar with problems that can occur for
04:38 Intel chips if the ramp-down is too fast; is that correct?
04:38 A. No.
04:38 Q. Okay. A fast ramp rate down can inject noise into
04:38 the system, right? Yes or no? Are you able to answer?
04:38 A. System -- no. I can't answer that. It's too
04:38 general.
04:38 Q. A ramp-down that is too fast can create noise,
04:38 correct? Can you answer that fairly yes or no?
04:38 A. I'd like to know more context with the question. A
04:38 ramp-down of --
04:38 Q. Or you can say you can't answer it yes or no.
04:39 A. Okay. I guess I can't answer that.
04:39 Q. Noise in the context of the processors would be
04:39 considered a bad thing, correct?
04:39 A. Not always.
04:39 Q. Noise -- when engineers are discussing noise as a
04:39 problem, they're considering it to be a bad thing, correct?
04:39 A. It depends.
04:39 Q. I'd like to show you PTX-4448.
04:39 MR. CHU: Can we -- we have on the screen -- and let's go
04:39 to Page 579 or Page 20 of PTX-4448.
04:40 Okay. Can we blow this up?
04:40 MR. LEE: I'm going to object. This isn't even the

accused products.

THE COURT: I'm sorry?

MR. LEE: I object. This is not even the accused products.

THE COURT: Mr. Chu?

MR. CHU: I'm showing him an Intel document and following up and hopefully refreshing him on how noise is discussed among Intel engineers.

THE COURT: Is this is a document that was disclosed during discovery? I take it it's an Intel document, right?

MR. CHU: It is an Intel document.

THE COURT: I'll overrule the objection.

BY MR. CHU:

Q. Okay. It's on your screen, Professor Sylvester.

A. Got it.

Q. Okay. This page is entitled "VCCLN Clamping and Architectural Throttling," correct?

A. Yes.

Q. And you see, three lines down, "existing VCCLN noise violating silicon reliability limit of 2.3 volts." In this context, the Intel engineers are discussing noise as a problem, correct?

A. In this case, yes.

MR. CHU: Let me just check something, Your Honor.

(Conference between counsel.)

MR. CHU: I think there's something odd about this copy.

BY MR. CHU:

Q. So, Professor, let me ask you to go to PTX-4448 and Page 20. It should be in one of the notebooks --

A. Okay.

Q. -- that you have there.

A. Is it the new one or the old one?

Q. Probably the new one.

A. Sorry. What's the PTX again?

Q. 4448.

A. Okay. And page number?

Q. 20.

A. Okay. It looks the same as this. Yeah.

Q. Oh. Well --

A. Is that right?

Q. -- let me try an alternative document. Do you have PTX-4449?

A. Yes. Yes.

Q. Try that. And it's -- there are document production page numbers, and at the bottom it's Page 698, meaning the last three digits. No. Let's see. At 20. Let's go to Page 20 of this document.

Let's do it this way perhaps. I'm going to show you a copy of a particular page, and we'll make sure we get the right page in a moment.

04:43 MR. CHU: May I approach, Your Honor?
04:43 THE COURT: Of course.
04:43 BY MR. CHU:
04:43 Q. Let me tell you, I'm going to draw your attention to the bottom of this page and it says, "TR exploration for modifying NLC-2 to have slower ramp rate to limit injected
04:44 VCCIN noise." If it's okay, can you see that at the bottom?
04:44 A. Yeah. I can see it. Yeah. It's the same.
04:44 Q. Okay. So, in fact, this shows that Intel engineers can be focused on the speed of the ramp-down or ramp-up to
04:44 solve problems caused by there being too fast a ramp-down in this case, correct?
04:44 A. In this case, yes.
04:44 Q. Okay. You would also agree that if the ramp rate of the Intel processors is not controlled carefully in terms of
04:44 the rate that it can also cause product failures, correct?
04:45 A. Not necessarily.
04:45 Q. It can cause product faults, correct?
04:45 A. Not necessarily.
04:45 Q. Let's go to PTX-4450. This is an Intel document, and let's go to Page 6.
04:45 Do you see the title of this page is "ULT (d)(2)" -- "(g)(2) Over Current Faults," correct?
04:45 A. Yes. I see that.
04:45 Q. And you see the first bullet point is "PPV-PNG PPV-M

is failing approximately 4 percent of ULT 15-watt material for GT OCP faults." Do you see that?

A. Yeah. I see that.

Q. And then further down, you see that the Intel engineers wanted to solve this problem and they outlined three methods to resolve, the bullet in the middle of the page. The bullet in the middle is "three methods to resolve," right? Do you see that?

A. Yes.

Q. And the very first option that they put down was "reduce ramp rate." You see that?

A. I see that.

Q. And "by slowing the rate, the current demand is averaged out over a longer period." You see that?

A. I see that.

Q. So the Intel engineers want to carefully control their programmable ramp-down rate. They want to control or regulate the way in which that voltage was being decreased to minimize the problems with the chip; is that correct?

A. You're referring to this slide?

Q. Yes.

A. Apparently. Yes.

Q. Thank you very much. Thank you for your time, Professor.

MR. CHU: No further questions.

THE WITNESS: Thank you.

REDIRECT EXAMINATION

BY MR. LEE:

Q. Professor Sylvester, I just want to ask you about three or four subjects quickly.

MR. LEE: Could I have PTX-3675, which was the very first thing Mr. Chu asked you about?

BY MR. LEE:

Q. Do you remember that?

A. I think so.

Q. We're going to put it on the screen, and we're going to expand it and look at the section that he focused on for the CLR/CBO. Do you see that?

A. I do.

Q. And he focused you on Vmin. Do you see that?

A. Yes.

Q. Would you tell the ladies and gentlemen of the jury, is that an active minimum voltage or a minimum retention voltage?

A. Yeah. So this is why I struggled to answer some of the questions initially because it's confusing terminology. At Intel they use Vmin, that specific notation, to indicate the lowest voltage to meet a frequency. So in this case actually there's a frequency number right next to the voltages, like 1.9 GHz.

04:48 So the voltage of .75 volts here is a voltage that will meet a speed requirement. It will operate lower. It will retain lower. It will read lower. It will write lower. So it's not a minimum operating voltage. That's the term that's key to the patent and to infringement contentions.

04:49 So this Vmin is a little bit confusing in that respect. And so that's this.

04:49 Q. Now, when Mr. Chu blew up this section, he didn't include the column "Clock Frequency," right next to Vmin and Vnom, correct?

04:49 A. That's right.

04:49 Q. And what does that tell you about whether the clock frequency is a minimum retention voltage?

04:49 A. I'm sorry. The clock frequency?

04:49 Q. What -- the fact that there is a clock frequency, what does that tell you about Vmin?

04:49 A. I mean, generally, as I said, for Vmins, Intel uses it to meet a performance specification. That doesn't mean it's a minimum operating voltage of any type. So in this case these are active voltages to meet performance specifications. They're not minimum operating voltages.

04:49 Q. Is it a minimum retention voltage?

04:49 A. No. It's not.

04:49 Q. And Dr. Conte identifies as a minimum operating voltage the RING_RETENTION_VOLTAGE, correct?

A. That's right.

Q. And that's for products shipped to customers, correct?

A. That's right.

Q. And do you know whether the C6 SRAM in products that are actually shipped to customers actually speaks to the .75 volts listed on this chart?

A. So the -- you know, the analysis I did demonstrated, for instance, that the C6 SRAM operates at voltages well below this, right? The Ring_VF_Voltage_0 was significantly below this in the data I actually collected from the products.

Q. And now, I notice that the Vmin and the Vnoms are the same for all the parts of the ring domain. Do you see that?

A. Yes.

Q. What's that tell you?

A. Well, they're applying one voltage to that whole domain. So, you know, that's what they're going to run it at. It has to be a single voltage because it's all tied together.

Q. Does this chart have anything to do with the RING_RETENTION_VOLTAGE?

A. No.

Q. Does it have anything to do with what Dr. Conte identified as the minimum operating voltage for his infringement analysis?

A. No. It doesn't.

04:51 Q. Nothing at all?
04:51 A. No.
04:51 Q. Now, could I have --
04:51 MR. LEE: I have to ask our colleagues to bring PDX-4.30 [sic] because I don't think we have it. Can you bring that up for us?
04:51 BY MR. LEE:
04:51 Q. Now, Mr. Chu covered two points at the beginning on the issue of infringement. We just looked at one, the Vmin.
04:51 Now, I want to go to the second, which is the chart he put up, 4.30 [sic]. And when he was asking you about the left-hand side, you did tell him that you created this as part of your work in this case, correct?
04:52 A. Yes.
04:52 Q. But I think you wanted to tell him where it came from, and he wouldn't let you or he didn't ask the question.
04:52 Where did this come from?
04:52 A. Well, it came from the data, right? So, you know, the fact that the RING_RETENTION_VOLTAGEs that are fused into the actual products is larger than -- quite a bit than the Ring_VF_Voltage_0 is reflected in the drawing that I put up on the left, okay?
04:52 And the fact that that's not consistent with the drawing on the right is not surprising to me because that just says V_RETENTION. That's not saying that's the

RING_RETENTION_VOLTAGE fuse. That's just a line saying that you should be able to retain down below there. That's all.

Q. So is your diagram based upon data from products that were actually analyzed?

MR. CHU: Objection, leading.

BY MR. LEE:

Q. What is your data based upon?

A. The four million or so parts of fuse data that I analyzed.

Q. And from that four million or so parts that you analyzed, did you determine the RING_RETENTION_VOLTAGE?

A. Yes.

Q. Where is it?

A. It's about where I put it here. It's midway between the VF_VOLTAGE_0 and VF_VOLTAGE_1. I don't remember exactly where, but it's significantly higher than VF_VOLTAGE_0.

Q. Now, what's on the right-hand side has a label "Actual Intel Evidence." That's not on the document, is it?

A. No.

Q. That's something the lawyers added?

A. Apparently.

Q. And do you know whether the V retention has anything to do with the RING_RETENTION_VOLTAGE of actual products?

A. It's not even clear from this figure this relates to the ring, and of course the ring is not the same as the C6

04:53 SRAM, the accused memory, so there's a big disconnect there.
04:54 Q. So I now want to talk to you a little bit about the
04:54 alternative designs that Mr. Chu asked you about.
04:54 MR. LEE: Could I have DDX-7.43 on the screen, please?
04:54 BY MR. LEE:
04:54 Q. Do you recall testifying about this?
04:54 A. Yes.
04:54 Q. Just to remind us, on the left-hand side is what?
04:54 A. That's generally the behavior of the actual Haswell
04:54 and Broadwell parts in Package C7.
04:54 Q. The bottom right-hand side is what?
04:54 A. That is the proposed alternative to estimate power
04:54 savings of the power mux by Dr. Annavaram.
04:54 Q. And the top two categories or the top two boxes are
04:54 what on the right?
04:54 A. Those are representing designs of Intel previous
04:55 product that also use the C6 SRAM's concept.
04:55 Q. Now, Mr. Chu asked you some questions about whether
04:55 the alternative designs in the top right-hand corner were
04:55 better than some other designs.
04:55 Was your purpose in identifying these to identify which
04:55 designs were better?
04:55 A. I don't think I ever said they were better.
04:55 Q. I'm pretty sure you didn't. What were you
04:55 identifying these designs for?

A. They are alternatives to the C6 SRAM power mux design that would achieve the goal of the C6 SRAM power mux without using that.

Q. And in the bottom right-hand corner is Dr. Annavaram's proposed alternative, correct?

A. That's right.

Q. The only one he considered?

A. That's right.

Q. Is there any Intel document considering that alternative as a viable alternative?

A. No. Definitely not.

Q. Now, let me just ask you these final two questions. Based upon all the work -- three questions.

(Laughter.)

MR. LEE: I caught myself before you would say anything.

MR. CHU: No objections to three questions.

(Laughter.)

BY MR. LEE:

Q. Let me ask you these final three questions.

Do the Broadwell processors use the invention of the '373 patent?

A. Given my analysis, no. They do not.

Q. Do the Haswell processors use the inventions of the '373 patents?

A. No. They do not.

04:56 Q. Do they do things differently and for a good reason?
04:56 A. Yes. They do.
04:56 MR. LEE: Thank you. Thank you, Dr. Sylvester.
04:56 THE COURT: Mr. Chu?
04:56 MR. CHU: Professor Sylvester, thank you very much for your time. No further questions.
04:57 THE COURT: Dr. Sylvester, I apologize. You're free to go. You're also free to stay. And so you'll -- you're certainly welcome here in Waco at any time. But you are dismissed from your service. Thank you.
04:57 Mr. Lee, who would you call next?
04:57 MR. LEE: Your Honor.
04:57 THE COURT: Yes, sir.
04:57 MR. LEE: I think probably best thing to do, if it's good with the jury and good with you, is we could put our next witness on, just cover his background and then suspend for the day if that's okay.
04:57 THE COURT: Okay.
04:57 MR. LEE: Or we can start him first thing tomorrow. He's a fact witness.
04:57 THE COURT: If I could have you and Mr. Chu up here for just a second.
04:57 (Bench conference.)
04:57 THE COURT: Just before I agree to that, I just want to make sure, you all know the case better than I do. You all --

we're going to be done with the evidence by Monday and closing arguments Monday, right?

MR. CHU: I'd like an opportunity to talk to my colleagues about it, but I know that's Your Honor's goal and we, of course, both have time limits.

THE COURT: Because once -- I don't know how much time you have used. I tried to time it out where if we're doing as much as we need to do, your time would run out, more or less, middle -- by the end of the morning, Monday. But just so you know, that's -- I really want to get this case charged and argued on by the end of the day Monday.

MR. CHU: Okay.

THE COURT: And other than -- so I'm happy to quit now. We're probably going to have to go tomorrow around 5:00.

MR. CHU: They have deposition plays or to call Dr. Rotem for the start. I would like -- I think Your Honor already let the jury know we might go a little bit late. I'd rather use the time than have the possibility that we're just going to run out of time.

MR. LEE: Dr. Rotem's background is going to take us about five minutes. The reason -- before I can figure out what I'm doing on depositions, let me get Your Honor's -- and counsel on Fortress because several of them are Fortress depositions.

THE COURT: Oh, gosh. No, no, no. You're right. You're right. Okay. So, well, here's what we'll do. Why don't we --

here's what we're going to do. We're going to start tomorrow at 8:30 instead of 9:00.

You all, if you have issues, you need to be here by -- we'll take up issues at 8:00. And we're going to stop issues at 8:29, whether they're resolved or not.

MR. CHU: Okay.

THE COURT: So we'll start at 8:30, and we'll go tomorrow. If we have to go to 5:30 tomorrow, we will because all I have tomorrow tonight -- my date night is with you guys.

(Laughter.)

THE COURT: And so --

MR. LEE: I'm almost 71 years old. There are no more date nights.

THE COURT: And so which one of you gentlemen is older?

MR. CHU: I don't know.

MR. LEE: We're almost --

MR. CHU: Although, Helen, my wife and I, we recently had our fiftieth anniversary. So at least in terms of anniversary dates, you're ahead of Bill and Leslie.

My only concern, and the schedule for today and starting early tomorrow is great, is that we don't get pressed and squeezed in time for our rebuttal case just because --

THE COURT: You're going to have -- I'm going to make sure you have enough time for your rebuttal testimony, and that may involve Monday starting at 8:30 as well. We'll get it.

I'm not going to penalize anyone to get this done. I don't want that reputation. I don't want it to be -- so, but we'll finish Monday, I'm confident.

MR. LEE: Okay. I think, you know, Your Honor's advice about the length of the closings being 45 minutes or so, we'll get it done Monday.

THE COURT: Okay. Very good. Thank you.

Oh, Mr. -- do you -- why don't we just wait -- five minutes isn't going to make a difference.

MR. LEE: Okay. Yeah. I wouldn't do it. I wouldn't do it.

THE COURT: Okay.

(Bench conference ends.)

THE COURT: So let's go back on the record if we might.

Ladies and gentlemen of the jury, we are going to -- we were uncertain of how long the last gentleman would take, and so I thought we might go a little bit later today.

But we thought he might be on the stand longer than he was, so that's my fault for not getting -- not having enough ducks in a row to keep going.

We're going to start tomorrow at 8:30. The reason why I'm doing all this is we very much are planning on finishing this trial Monday.

And I want to make sure we get it done Monday. And so we'll start a little early tomorrow. We may go a little late

tomorrow night. We may not. But I can assure you this: We will be done Monday.

Those of us will be done Monday, meaning you will begin deliberating on Monday. Once you begin deliberating, the time you spend deliberating is exclusively in your province. That has -- no one in here has anything to do with that.

You all deliberate for three minutes or whatever, I won't say another number, but whatever it is is whatever it takes for you all to come up with a unanimous verdict. And that's fine. That's you all's time to make the right decisions.

But for our part, we're doing well, but I have to -- I will take this time to tell you one more thing, then I'll let you go.

I've done this a very long time. I know I don't look at it because I don't look very old, but I've done this a really long time.

The quality of the lawyers that you've seen already for the first four days has been the very best that I've ever seen in a trial. You are -- while you are -- this is a hard case and it's going to go a little bit long, you should leave here knowing that you literally won the lottery in terms of the quality of the lawyers that you're getting to see in front of you.

So when you begin your deliberations, I hope you keep in mind you've truly had the best -- both parties have had the

very best representation they could possibly have hoped for.

So I hope you have a good evening. You can't discuss the case amongst yourselves or with anyone else.

If you'll be here at 8:15 tomorrow, we will begin. I can commit to this, I've told the lawyers: We are starting tomorrow at 8:30. If that means we have to get here early, we'll get here early, but we're going to begin at 8:30. Thank you.

THE BAILIFF: All rise.

(Jury exited the courtroom at 5:03.)

THE COURT: If you all give us a few seconds, Suzanne will get the time.

Mr. Chu, is there anything that we need to take up?

I'm going to look at the depositions tonight with regard to the Fortress issue. And I'll do my very best to get through all of them this evening.

If anyone has any -- Mr. Lee, you can jump ahead if you have anything.

MR. LEE: Nothing for us, Your Honor.

THE COURT: Mr. Chu?

MR. CHU: Nothing at this time. Thank you.

THE COURT: Two things. Number one, if you all will wait just a second, Suzanne's going to come up with the numbers. And number two, you may be doing this without me knowing it, make sure that we're getting in the record and exchange with

each other which exhibits you believe are in evidence.

As long as you all are taking care of it, that's fine, but just make sure that -- because if we let it go too far without me being involved, I might not be able to help.

So the plaintiff has used 7 hours and 48 minutes. The defendant has used 7 hours and 44 minutes by our reckoning, so...

I have one more thing to do up here, but I'm done. You all are free to do whatever you need to do. Thank you.

By the way, today was a terrific day. I appreciate all the lawyering. I appreciate the witnesses. It was a really great day to get to sit up here. You all have a good evening. I'll see you tomorrow morning.

(Hearing adjourned at 5:06 p.m.)

UNITED STATES DISTRICT COURT)
WESTERN DISTRICT OF TEXAS)

I, Kristie M. Davis, Official Court Reporter for the United States District Court, Western District of Texas, do certify that the foregoing is a correct transcript from the record of proceedings in the above-entitled matter.

I certify that the transcript fees and format comply with those prescribed by the Court and Judicial Conference of the United States.

Certified to by me this 8th day of March 2021.

/s/ Kristie M. Davis
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